AN INVESTIGATION OF RELATIONSHIPS BETWEEN SELECTED CLASSES OF TEACHER BEHAVIOR AND STUDENT GAINS IN A COMPONENT OF CRITICAL THINKING ABILITY

By

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The objective of this study was to explore relationships between specific categories of teacher verbal behavior and student growth in conditional reasoning in secondary social studies classes. The sample consisted of 13 seventh-grade teachers and their classes from a 17-member sample of convenience. One class for each participating teacher was randomly selected for the study and pretested using the Cornell Conditional Reasoning Test, Form X (CCRT). During the next 11 weeks, each teacher audio-taped a lesson in the selected class in each of the three designated time periods. At the end of the 11-week period, the CCRT was administered as a posttest.

The audio-tapes were transcribed by a professional secretary. A trained coder then coded the transcripts using the Technical Skills Observation Schedule (TSOS) to ascertain the frequency of specific teacher verbal behaviors.

The TSOS is a low inference observation instrument focusing on seven classes of verbal behaviors or moves utilized by teachers, in the development of skills, information, and values in students. The seven moves encompass 51 discreet behaviors and are labeled as functional or dysfunctional. The five functional moves are structuring, conditional, wait-time, probing, and reacting. The two dysfunctional moves are obstructive and inhibiting.

A regressed gain score was computed for each student, and class mean gain scores were established. Linear relationships between the mean regressed gain scores and teachers' mean and median frequency for each of the seven moves were identified using the Pearson product moment correlation formula. An a priori level of .05 was utilized for testing the hypotheses.

As a result of the investigation two significant relationships were identified with regressed mean student gain scores. Teachers' mean frequency of structuring moves had a significant negative correlation, and teachers' mean and median frequency of inhibiting moves had a significant positive correlation. The author concluded that although critical thinking is a valued goal in the social studies, limited student growth in the aspect of conditional reasoning occurred in the classes studied.

CHAPTER 1
INTRODUCTION

Statement of the Problem

This study explored relationships between specific categories of teacher verbal behavior and student growth, by class, in conditional reasoning in seventh-grade social studies classes. Research related to teacher behavior and to critical thinking was used in order to identify variables and explain results.

The classroom environment contains many stimuli which may affect student learning either positively or negatively. It is reasonable to assume that the teacher should maximize the use of stimuli to achieve goals of student learning. The identification of stimuli which aid the teacher in attaining goals without the need for direct instruction contributes to the development of classroom efficiency.

Gregory (1972) investigated correlates between teacher verbal behavior, specifically the use of conditional logic, and student growth in conditional reasoning in seventh-grade mathematics classes. An unstated assumption of the study, as illustrated by Gregory's literature review of incidental learning, was that the worthwhile goal of conditional reasoning growth in students might be achieved incidentally to intentional instruction directed toward the achievement of regular mathematics objectives.

The positive results in Gregory's investigation led Gregory and Casteel (1974) to expand the investigation to include social studies as well as mathematics classes at the eighth-grade level. The researchers attempted to identify a range of both teacher and student verbal behavior correlates of conditional reasoning. However, they found conflicting results between mathematics and social studies classes.

This study attempted to extend the work begun by Gregory and continued by Gregory and Casteel. Data were collected and analyzed which are relevant to the achievement of valued instructional ends by means of incidental instruction in social studies classrooms.

Rationale

Critical thinking has been a historical concern in education. Leef (1968) indicated that

> The social studies throughout most of the twentieth century have been charged with the responsibility of developing critical thinking skills in order to equip individuals with an effective and efficient technique for the solution of the problems of society. (p. 250)

Dewey (1916), a leading philosopher of modern American education, stated:

> No one doubts, theoretically, the importance of fostering in school good habits of thinking. But apart from the fact that the acknowledgement is not so great in practice as in theory, there is not adequate theoretical recognition, that all which the school can or need do for pupils, so far as their minds are concerned (that is, leaving out certain specialized muscular abilities), is to develop their ability to think. (p. 179)

Garris (1974) traced concern for critical thinking as a specific element to Spencer and his social adaptation of Darwin's theory of evolution. He also identified Watson's (1925) work on fair mindedness as the point at which empirical investigations were initiated.

With the advent of World War II, concern with citizenship education increased. This concern, in turn, stressed the role of critical thinking as a key element of such schooling. Anderson (1942), introducing the 13th Yearbook of the National Council for the Social Studies, stated:

> In this period of fearful crisis [World War II] teachers must help American youth to become informed to think effectively about the problems of our day, and to take part in formulating public opinion and making group decisions effective. (p. v)

Additionally, Anderson indicated that "social studies teachers have long accepted critical thinking as an important and desirable outcome of instruction" (p. v). Anderson's words endured; Barry Beyer used them to introduce the April, 1985, issue of Social Education, which is devoted to critical thinking. Wilson (1942) reflected this acceptance in his statement that "critical thought in the individual's life as a citizen is our chief concern" (p. 93).

Marcham (1942) listed six instructional goals that he perceived to be relevant to critical thinking. These were

1. The pupil should learn the method of critical thinking.

2. The pupil should gain experience in applying the method to the solution of social problems.

3. The pupil should learn the need for caution in accepting solutions of social problems which he himself cannot check.

4. The pupil should develop maximum efficiency in the solution of social problems.

5. The pupil should learn to reconsider his social philosophy.

6. The pupil should learn that constant use of critical thinking as a preliminary to social action is essential to the democratic way of life. (p. 45)

Following World War II, Miller and Weston (1949) recognized "the problem of equipping all the children of all the people with the skills needed to live in a democratic society has become more complex. One of the indispensable skills is critical thinking" (p. 315).

Contemporary teachers and educators have made critical thinking a primary concern. The Educational Policies Commission (1961) of the National Education Association, in identifying the central purpose of the school, concluded that

> The purpose which runs through and strengthens all other educational purposes--the common thread of education--is the development of the ability to think. This is the central purpose to which the school must be oriented if it is to accomplish either its traditional tasks or those newly accentuated by recent changes in the world. To say that it is central is not to say that it is the sole purpose, or in all circumstances the most important purpose, but that it must be a pervasive concern in the work of the school. Many agencies contribute to achieving educational objectives, but this particular objective will not be generally attained unless the school focuses on it. In this context, therefore, the development of every student's rational powers must be recognized as centrally important. (p. 16)

The Commission further stated "that the school's other objectives can be better achieved as the students develop the ability to think" (p. 16). Echoing the Commission, Eullie (1968) asserted:

> Of the many tasks schools are called upon to perform--self-adjustment, occupational training, preparation for citizenship, worthy use of leisure, driver education, etc.--the two most significant challenges are the development of man's rational powers and the deepening of his understanding of himself and his physical and social environment. (p. 216)

In the realm of social studies the admonition of the Educational Policies Commission has been closely tied to citizenship education. The President's Commission on Higher Education (1947), Rippa (1959), Burton, Kimball, and Wing (1960), Chausow (1965), Kemp (1963), Goldmark (1966), Oliver and Shaver (1966), and Roselle (1966) have all emphasized the importance of critical thinking to effective citizenship. Bostwick et al. (1953) succinctly stated ". . . The success of a democracy is predicated, not upon an elite minority of critical thinkers, but upon a citizenry in which they constitute the rule rather than the exception" (p. 45).

The primary organization concerned with the establishment and maintenance of professional behavior in the social studies is the National Council for the Social Studies. This organization has published four yearbooks--in 1942, 1953, 1963, and 1967 dealing with aspects of critical thinking. In addition, the organization has published test manuals and bulletins emphasizing critical thinking. The continued emphasis on critical thinking in social studies was reflected in a National Council for the Social Studies bulletin by Barr, Barth, and Shermis (1977) who, in tracing the emergence of a definition for the social studies, and the role of the Commission on the Social Studies, concluded that

> . . . out of a decade of intensive study and research by some of the most influential scholars in the various academic areas concerned with

> social studies, a common conception and definition began to take form. The goal of the social studies was to develop effective, critically thinking, and participating citizens through the study of history and the social sciences. (p. 32)

During this decade, critical thinking has continued to claim the attention of professional educators. Institutes on critical thinking sponsored by school districts, professional organizations, and consultant firms abound throughout the nation. In 1985 the National Council for the Social Studies devoted an issue (April) of its journal, Social Education, and a chapter of its research review bulletin to the topic.

The value of critical thinking has often been stated in terms of the terminal goals of education, suggesting that critical thinking represents a high school goal. Cline (1956) emphasized the importance of critical thinking in the junior high school, stating

> The kind of adult this youngster is becoming depends, of course, upon the experiences which have been taught him, upon the guidance and direction given to his learning activities, and above all, upon himself and his immediate world. Herein lies a two-fold responsibility of teachers of junior high school pupils--especially of teachers of the social studies. This responsibility is to provide experiences which encourage thinking and which in time develop skill in the processes of critical thinking. (p. 113)

Leef (1968) insisted that critical thinking was also an elementary school objective. "At all grade levels, pupils must be guided in developing critical thinking and problem-solving skills so as to be prepared to preserve and strengthen the democratic way of life" (p. 254).

That critical thinking is a major responsibility of educators, particularly social studies teachers, at all grade levels has been

established. Nevertheless, two cogent thoughts have been included. Lundsteen (1969) argued that ". . . all problems are not solved by being able to think critically, but no problem is solved without it" (p. 119). Fenton (1967) philosophized that "critical thinking is better than uncritical thinking; this canon underlies the entire scholarly world" (p. 42).

Given the concern for critical thinking evidenced in the literature, it has become the responsibility of educators who work with curriculum materials and teachers to provide guidance for teachers on how best to achieve the goal both through intentional and incidental instruction. This study was intended to contribute to the knowledge of those who attempt to fulfill this responsibility.

Procedure

Thirteen seventh-grade teachers from a 17-member sample of convenience participated in a correlational study investigating relationships between the frequency of selected teacher verbal presentation behaviors and student growth, by class, in conditional reasoning. One class for each participating teacher was randomly selected for the study and pretested on September 1, using the Cornell Conditional Reasoning Test, Form X (Ennis et al., 1964). During the next 11 weeks each teacher audio-taped a lesson in the selected class in each of three designated time periods. The audio-tapes were coded using the Technical Skills Observation Schedule (Casteel and Gregory, 1979) in order to ascertain the frequency of specific teacher verbal

behaviors. On November 29, the Cornell test was again administered as a posttest.

The following questions were posed:

1. How much conditional reasoning growth occurs in secondary social studies classes?

2. What is the frequency of specific teacher verbal presentational behaviors in secondary social studies classes?

3. What relationship exists between the frequency of specific teacher verbal presentational behaviors and student growth by class in conditional reasoning?

Hypotheses

The following null hypotheses were tested in the study:

1. Teachers of seventh-grade geography do not use the moves of structuring, conditional, wait-time, probing, reacting, obstructive, or inhibiting.

2. No linear relationship exists between the frequency of teacher structuring moves and regressed student gain scores in conditional reasoning.

3. No linear relationship exists between the frequency of teacher conditional moves and regressed student gain scores in conditional reasoning.

4. No linear relationship exists between the frequency of teacher wait-time moves and regressed student gain scores in conditional reasoning.

5. No linear relationship exists between the frequency of teacher probing moves and regressed student gain scores in conditional reasoning.

6. No linear relationship exists between the frequency of teacher reacting moves and regressed student gain scores in conditional reasoning.

7. No linear relationship exists between the frequency of teacher obstructive moves and regressed student gain scores in conditional reasoning.

8. No linear relationship exists between the frequency of teacher inhibiting moves and regressed student gain scores in conditional reasoning.

An a priori .05 level of statistical significance was used to test these hypotheses.

Definition of Terms

Students' conditional reasoning ability: The conditional reasoning ability of students, by class, as measured on the Cornell Conditional Reasoning Test (Form X).

Regressed student gain scores in conditional reasoning: The mean of the differences between students' posttest scores and predicted posttest scores on the Cornell Conditional Reasoning Test, Form X, as computed with standard regression formulas.

Specific teacher verbal presentation behaviors: The seven teacher moves delineated by the Technical Skills Observation Schedule (Casteel and Gregory, 1979).

Teacher Move:* A discrete and observable behavior that may occur when teachers are conducting classes using such methods as recitation or discussion.

Structuring Move:* A teaching behavior in which the teacher establishes or re-establishes a context within which students are to understand classroom events.

Conditional Move:* A teaching behavior in which the teacher provides a logical premise in terms of which a conclusion is to be derived.

Wait-time Move:* A teaching behavior in which there is an interval of at least three seconds of silence in association with student review, student recitation, student discussion, or teacher lecture.

Probing Move:* A teaching behavior in which the teacher uses verbal behaviors in order to extend the length of a student statement or of the statements made by several students or to raise the level of thought being applied.

Reacting Move:* A teaching behavior in which the teacher uses verbal behavior in order to provide students with feedback concerning their behavior.

Obstructive Move:* A teaching behavior in which a student, the teacher, or other persons in close proximity to the classroom make it difficult for students to attend to learning tasks.

Inhibiting Move:* A teaching behavior in which the teacher or students engage in behaviors that threaten the personal dignity or well-being of a student or students.

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*The definitions are paraphrased from the Technical Skills Observation Schedule (Casteel and Gregory, 1979). More precise descriptions of the moves are available in the description of the instrument in the appendix.

Assumptions

1. None of the teachers participating in the study had been trained in the skills involved in the Technical Skills Observation Schedule. Thus, these skills may be below or above the optimum use of these behaviors.

2. The three audio-tapings of the teachers involved were sufficient to provide an adequate measure of their normal classroom behavior.

3. The classes selected for this study contained heterogeneously grouped students in schools with varying SES characteristics and provided a random distribution of sex, intelligence, motivation, and social studies aptitude.

4. The instruments selected accurately measured the variables identified.

5. An 11-week interval allowed a reasonable amount of time for growth in critical thinking to occur.

Limitations

The sample of convenience in which the teachers volunteered to participate in the study may have resulted in an atypical teacher population.

Delimitations

1. The study was limited to social studies teachers and their students in the World Geography course in a small metropolitan school

district (approximately 13 thousand students) during the 1983-84 school year.

2. Growth in conditional reasoning ability was the only product to be correlated with the selected teacher behaviors.

CHAPTER 2
LITERATURE REVIEW

This chapter reviews literature in both dimensions of the study. In section one correlates and effects of specific teacher verbal presentational behaviors are reported. In the second section empirical investigations involving student growth in critical thinking are analyzed.

Teacher Behavior

Gleason (1978) identified three approaches to the analysis of teacher behavior. These were as follows:

1. Broad approach championed by the American Association of Colleges for Teacher Education.
2. Technical approach using highly controlled laboratory-type experiments to develop skills to increase teacher effectiveness.
3. The study of teaching. (p. 5)

This latter approach, exemplified in studies reviewed by Dunkin and Biddle (1974), has emphasized direct classroom observation, and the results of this type of research are the primary focus of this review.

Researchers studying teaching have visualized the classroom as a social system. Dunkin and Biddle (1974) have elaborated four classes of variables in the classroom: presage variables, context variables, process variables, and product variables. According to the Dunkin and

Biddle model, the process of teacher behavior results from the presage variables of teacher formative experiences, teacher training experiences, and teacher properties; the context variables of pupil formative experiences, pupil properties, school and community contexts, and classroom contexts; and the process variable of pupil classroom behavior. Teacher classroom behavior is viewed as affecting the process variable of observable changes in pupil behavior and the product variables of immediate pupil growth and long-term pupil effects.

The accountability movement and a thrust toward competency-based teacher education, aided by the development of increasingly sophisticated observation instruments, have resulted in efforts to identify more specific types of teacher behavior. The results of this research, particularly in the area of process-product links, have often appeared contradictory and confusing. Consequently, they have provided little guidance.

Illustrations of conflicting research findings and explanations for the problem have been provided by Rosenshine (1971), Dunkin and Biddle (1974), and Gage (1978). They have cited a number of problems. Inconsistencies in statistical treatment and use of terminology have contributed to ambiguity. The failure to operationally define terms and the use of a wide range of observation instruments and achievement measures have also made interpretation difficult. The result of these practices, according to Gage, has been a tendency to view the research results negatively and to commit a "type II error," that is, "an error of considering a relationship or differences to be non-existent when it does, in fact, exist" (p. 26). Gage concluded that through vote

counting, testing the significance of combined results, and averaging related correlation coefficients to analyze research results on specific variables, there was more support for educational practices than would otherwise appear to be the case.

This study, which investigates correlates between selected teacher behaviors or moves and conditional reasoning, is primarily concerned with the relationships between process, in the form of teacher behavior, and product, in the form of student achievement. To avoid duplicating the excellent literature reviews already available--Dunkin and Biddle (1974), Rosenshine (1971), Medley (1977), Rosenshine and Stevens (1984)--and maintain a manageable quantity of information, only selected studies related to the moves included in the Technical Skills Observation Schedule will be cited.

Structuring Move

Reviews of the literature which include structuring have been conducted by Rosenshine (1971), Heath and Nielson (1974), Gleason (1978), Casteel and Gregory (1979), Florida Coalition (1983), and Berliner (1984). These reviews, which cite 19 studies, show inconsistencies in results, interpretation of results, operational measures of structuring, and measures of achievement. Rosenshine (1971) summarized the state of the art in that

> Both the high-inference and low-inference studies of structuring have yielded a large number of significant results. In all seven studies, for which levels of significance could be determined, the results were significant. However, the variation in low-inference measures, and the difficulty of relating high-inference and low-inference measures, make any conclusions premature. (p. 115)

Work by Furst (1967), Soar and Soar (1979), and the Florida Coalition (1983) suggests that further investigations on the placement of structuring to classroom discourse and curriculum as opposed to linear relationships between structuring and achievement will provide more consistent results to support the use of structuring. The weight of evidence indicates a positive correlation between structuring and achievement measures in specific grade levels, and the Florida Coalition (1983), discussing the use of behavioral objectives in structuring, concludes that "for another thing, it is a matter of professional experience that students are likely to achieve more when they know what they are expected to learn no matter how they are informed . . ." (p. 77).

Conditional Moves

Conditional moves, unlike structuring, are rarely referred to in literature reviews and have been the subject of few research studies as reflected by the Florida Coalition (1983) search for data on the teaching of explanatory knowledge. Gleason (1978) cited work by Hunkins (1974) and Hunkins (1976) while Gregory (1972) referred to the efforts of Smith and Meux (1970). Each study was related to the incidence and importance of conditional moves but did not address the question of cause-and-effect relationships. Only three process-product studies were conducted. Rosenshine (1968) found a positive correlation between linking words and student achievement; Gregory (1972) determined that students exhibited more growth in conditional reasoning ability while in classes where teachers exhibited a higher frequency of conditional moves; Gregory and Casteel (1975) verified

Gregory's earlier findings with a population of eighth-grade students but found a negative correlation for eighth-grade social studies students.

The evidence to date, though limited, appears to be consistent. Using these data, the Florida Coalition (1983) has advocated the use of conditional moves but limited the recommendation to cause-and-effect thinking as follows:

> If teachers analyze causal conditions and their effects, then students are more likely to comprehend cause-effect relationships. If teachers use linking words to connect the conditional part of a principle to the consequent part, then student achievement in explanatory content will be higher than if the connection is made with conjunctions such as "and" or, even less effective, not made at all. (p. 131)

Wait-Time

Wait-time, as a factor in the educational process, has become a subject of inquiry more commonly in recent years. Fowler (1974) found only four studies on wait-time in educational research and had to depend on research on counseling interviews to provide substantiation for his study. By 1978 Gleason was able to identify seven studies involving wait-time but many of these related to the acquisition and incidence of the move rather than causal or correlational research.

Studies on the effect of wait-time by Rowe (1972), Lake (1973), and Winterton (1976) as reported by Gleason (1978) found consistent relationships between teachers' use of wait-time and student cognitive verbal behaviors. Fowler, cited earlier, reported that increased teacher reaction wait-time produced an increase in the incidence of student-to-student interaction, a decrease in student inferences, and

an increase in student-initiated statements. The Florida Coalition (1983) concluded that lengthening pauses after student responses increased students' use of inference statements backed up by evidence.

Research using tested achievement or growth measures related to wait-time has been reported in two studies. Gregory and Casteel (1975) reported a significant positive correlation between wait-time and student growth in logical reasoning ability in mathematics and social studies classes, while Tobin and Capie (1982) indicated that teacher's wait-time after asking questions related significantly to achievement in science.

Probing Move

Process-product research supporting teacher utilization of the probing move proved difficult to identify because few researchers have studied the move in isolation. Instead, investigators have included component behaviors as part of directness-indirectness studies or other broad views of teacher behavior. Gall et al. (1978) defined probing as "the teacher asking a follow-up or 'probing' question to have the quality of or elaborate an initial answer" (p. 176). Gall et al. cited three studies, Soar (1966), Spaulding (1965), and Wright and Nuthall (1970) which correlated probing and redirection with student achievement. In their review Gall et al. referenced criticism of the studies by Heath and Nielson (1974) and concluded that it was not the behaviors themselves which correlated but rather "factors on which these behaviors loaded" (p. 177). Although probing is identified as one of 11 strong variables identified in process-product research by

Rosenshine and Furst (1971), they concluded from their view that "further study of such teacher behaviors appears warranted" (p. 53).

Reacting Move

Many of the components of the reacting move have been included in more general research into indirectness, teacher use of student ideas, and recitation strategies or in specific studies of the effects of praise. Casteel and Gregory (1979) cited three studies of reacting. Gleason (1978) reported nine studies, six of which attempted to relate reacting and achievement. Blaney (1983) found five studies of the relationship between the "recitation strategy" and achievement. Although results and definitions have varied, a consistent pattern has emerged demonstrating a positive relationship between reacting behaviors and student achievement in a variety of subjects and grade levels.

Obstructive Move

The obstructive move is one of two dysfunctional moves identified in the Technical Skills Observation Schedule. As with the probing and reacting moves, more research is evident on component behaviors than the comprehensive obstructive move. Two of the component moves--internal disruptive and external disruptive--appear to be self-evident interference in the learning process. The use of designated solicitation has been condemned by the Florida Coalition (1983), which strongly advocates designating students after the question has been asked.

Postquestion structuring and multiple solicitation were described as confusing to the learner by Hunkins (1974), and Dunkin and Biddle (1974) concluded that postquestion structuring interfered with student achievement. In research studies, Wright and Nuthall (1970) found a negative correlation between postquestion structuring and student achievement, as well as a negative correlation between multiple questions and student achievement. Gleason (1978) cited a study by Casteel and Stahl (1973) in which student expressed confusion correlated negatively with student growth. Gregory and Casteel (1975) found a significant negative correlation between student expressed confusion and student growth in logical reasoning ability in mathematics classes.

Inhibiting Move

Excessive criticism, a component of the inhibiting move, has been the subject of research endeavors. After reviewing 17 studies, Rosenshine (1971) found significant negative correlations between teacher use of criticism and pupil achievement on at least one criterion measure in half of the studies. In 10 of the studies the stronger form(s) of criticism had a higher negative correlation with achievement than the milder forms. Rosenshine cautioned the reader that ". . . the existing research on teacher disapproval or teacher criticism appears inadequate because insufficient attention has been given to the context in which these behaviors occur" (p. 61). In a study of a variety of teacher moves, Gregory and Casteel (1975) found a negative correlation between teacher interruptive behaviors and student growth in logical reasoning ability in mathematics classes.

Summation of the literature on teacher behavior requires a reiteration of Gage's (1978) comments to the effect that through vote counting, testing the significance of combined results, and averaging related correlation coefficients to analyze research results on specific variables, there is more clear support for educational practices. The State of Florida has used similar techniques to validate its Florida Performance Measurement System (Florida Coalition, 1983). This system, used in training and evaluating teachers, integrates many of the principles utilized in the Technical Skills Observation System.

Critical Thinking

Empirical research studies on critical thinking have been limited (Cohen, 1972; Curtis, 1980) and the results often inconclusive or contradictory. The focus of the studies identified has been on both content and process. Three general issues have been examined:

1. What relationship exists between direct instruction on logic and critical thinking skills and critical thinking growth for students?

2. What relationship exists between specific instructional processes and critical thinking growth in students?

3. What relationship exists between a combination of direct instruction on critical thinking skills and specific instructional processes and critical thinking growth in students?

Five studies examined the relationship between direct instruction on logic and critical thinking skills and critical thinking growth in students. Although student populations used in the studies ranged

from grades four through college level, the ratio of elementary to secondary studies (one to four) suggests a predisposed belief that direct instruction may be more effective at the secondary level.

In one of the earliest experimental studies on critical thinking, Glaser (1941) used eight 12th-grade English classes divided into control and experimental groups. He tested materials and procedures developed in order to improve critical thinking ability in secondary and college students. The two groups were pretested, and the experimental group received special instruction in critical thinking.

The author found that

1. the experimental group gained significantly more than the control group in critical thinking;

2. there was a .33 correlation between I.Q. and critical thinking improvement; and

3. ability in language and reading comprehension was closely related to critical thinking ability.

Different aspects of critical thinking were found to vary differentially as a result of the treatment.

Henderson (1958) conducted a two-year study to test the hypothesis that

> If knowledge related to the problems of (1) determining the meaning of an expression, (2) deciding whether or not an argument is valid, (3) deciding whether a statement is true or false, and (4) justifying opinions and evaluating other people's justifications of their opinions is taught, students will improve their ability to think critically. (p. 281)

Thirty-six teachers in four secondary subject areas were involved. Matching and covariance techniques were used to control important variables. Over the period of a year the experimental group students

made significant gains over control group students as determined by the Watson-Glaser Criticial Thinking Appraisal but failed to achieve significant gains on the A.C.E. Test of Critical Thinking, Form G. No systematic effort was utilized in order to verify that intended instruction was carried out, and no explanation was provided for the variance in performance on the two instruments.

Wallen, Haubrich, and Reid (1963) utilized nine 11th-grade United States history teachers--seven experimental and two control teachers--to test the effect of a unit on critical thinking followed by continuous reinforcement of the principles from the unit to course content. Using the Watson-Glaser Critical Thinking Appraisal, the I.D.S. Critical Thinking Test, and the Cooperative American History Test, the researchers tested students of participating teachers in the year prior to treatment and again during treatment.

The I.D.S. test showed that treatment group students made significant gains over both prior groups of students and control group students. In contradiction to these results, the Watson-Glaser test showed no significant gains by treatment group students. On content, the treatment group students showed significant gain over prior students but not significantly over control group students. The researchers were unable to demonstrate conclusively that critical thinking was improved, but they concluded that the I.D.S. test was superior to the Watson-Glaser test.

Creutz and Gezi (1965) used worksheets and exercises combining current events and critical thinking skills with world geography and world history students. The researchers developed an evaluation

instrument using content found in current events material and the dimensions of critical thinking stressed in the Watson-Glaser Critical Thinking Appraisal. After a 10-week treatment period, experimental students were found to have gained significantly more in critical thinking ability than had control group students. The validity and reliability of the evaluation instrument was not established by the researchers. Both groups were taught by a teacher aware of the study's goals, making the results questionable.

Mason (1963) investigated the effect of teacher-developed critical thinking skills with students in grades four through six. Results were found to vary, but "It could be stated that the self-contained units proved effective in teaching both science content and critical thinking skills . . ." (p. 21). Based on the results achieved and the flaws indicated in the research on direct instruction of critical thinking, Cohen's (1972) conclusion "that critical thinking abilities can be developed by both children and adults through systematic study" (p. 26) may be unwarranted.

Instructional Processes

Research on relationships between specific instructional processes and critical thinking growth in students has been more popular with researchers. Consequently, 17 studies were found. However, the results are no more conclusive. The following process studies have been grouped according to the process or processes being examined.

Miller and Weston (1949) guided low I.Q. 10th-grade geography students through a set of problem-solving activities on governmental

responsibilities regarding water pollution. The authors "observed" growth in the ability to do group planning and to state criteria before making decisions or taking action. Wrightstone's Test of Critical Thinking in Social Studies was administered as a pre- and posttest. Test results showed that the students improved over a control group only on the ability to draw conclusions. The authors' observations led them to conclude that performances had improved more than indicated by the test.

Kemp (1963) tested the effect of small group critical thinking problem solving sessions on the improvement of critical thinking ability in students with high and low dogmatism scores. Two groups of 40 college freshmen were equally distributed by dogmatism scores into a treatment and control group. Both groups were taught by the same instructor with only the instructional procedures varying between the groups. The Dogmatism Scale, Form E, the Otis Test of Mental Ability, Form A, and the Watson-Glaser Critical Thinking Appraisal were administered as pre- and posttests to determine equivalency of groups and change in critical thinking. Results of testing showed that the total experimental group scored significantly better than the control group. Within the experimental group the highly dogmatic group improved significantly.

A second group of studies focused on the relationships of direct/indirect instruction to critical thinking growth. The four studies in this category reported conclusive results only insofar as consistent failure to produce change may indicate that the variable being studied is not effective. Miller (1966) conducted a study on the relationship between teacher directness/indirectness and pupil thinking. Miller

postulated that low directness would result in higher student thought processes while at the same time high directiveness would produce greater mastery of facts. One hundred junior high students were divided into main treatment groups and subdivided into eight instructional groups. Half of the students received highly directive and half low-directive teaching. Lessons were recorded to verify the manifestation of correct behaviors and identify student responsiveness. The author found that low directive teaching resulted in student comments at higher levels of understanding. No significant differences were found between groups on the students' mastery of factual information. The failure of the low-directive teachers to follow the intended model of instruction made the results questionable.

Measel and Mood (1972) utilized observation instruments rather than objective testing to evaluate improvement in children's level of thinking at the elementary school level. Postulating a connection between teacher verbal behavior categorized as "direct" and "indirect" and pupil thinking, the authors further expected to find a relationship between the thinking level at which the teacher functions and the students' level of thinking. Using a sample of 15 second-grade teachers and Flanders' (1970) system of interaction analysis, the researchers observed each teacher for approximately 12 hours over five half-days. No significant difference was found between teachers' directness/indirectness and student thinking levels. This was attributed to the overall homogeneity of the sample which made it difficult to create significant variation. Although most teachers were categorized as "direct" teachers and functioned at a low level of

thought, a significant relationship was found between the teachers' functioning level and the students' level of intellectual functioning.

Armstrong (1970) tested two inquiry strategies to determine their effect on average to above-average eighth-grade social studies students' critical thinking skills. The two strategies were distinguished by the amount of guidance provided by the teacher "at critical points in the formation of subsuming concepts and generalizations." The Watson-Glaser Critical Thinking Appraisal, Form ZM, was used to assess critical thinking development, and additional instruments measured for side effects. Armstrong found that students in both groups increased significantly in critical thinking, but there was no significant difference between the groups. Armstrong did not use a control group. Vinelli (1975) investigated the effects of student-structured learning (SSL) and teacher-structured learning (TSL) in science on students' critical thinking ability, achievement-motivation, and affiliation motivation. Using 37 9th, 10th, and 11th-grade science students, the researcher administered the Watson-Glaser Critical Thinking Appraisal, Form ZM, and the Motivation Needs Inventory as pre- and posttest instruments. Following the pretest the students were divided into groups and received either SSL or TSL instruction from the same teacher. Posttest results showed no significant difference in students' motivation or critical thinking growth.

A third group of studies is less congruent. In this group, investigators examined broad categories of behaviors and attempted to identify correlates of critical thinking growth.

Lyle (1958) conducted a study of critical thinking using two sections of a college course in general psychology. One section was conducted in a traditional manner while the other section was taught using techniques such as extensive discussion, group work, problems approach, and thinking sessions, which the author believed would improve critical thinking. Students in both sections were pre- and posttested with A Test of Critical Thinking, Form G. No significant difference between performance of the two groups was evidenced by the test, but the authors, in analyzing results, concluded that students of higher academic ability increased in critical thinking ability under the experimental conditions, while students of lower ability increased in critical thinking ability under the control group conditions. At no point did Lyle define critical thinking other than to refer to it as performance on A Test of Critical Thinking. Neither did he articulate his rationale for the selection of the teaching techniques used in the experimental class.

Al-Khatab (1972) identified teaching competencies related to student critical thinking growth and studied 30 fifth- and sixth-grade classes. He hypothesized that students with the highest critical thinking scores would be found in classrooms with teachers who exhibited the greatest number of competencies. Using the "Davidson system" to evaluate students' growth, the author found there was no direct correlation between the identified competencies and students' critical thinking improvement.

Patelmo (1975) studied junior high introductory physical science teachers. He hypothesized that variations in teacher behaviors would result in variations in students' growth in critical thinking. The

Science Classroom Activity Checklist was used to measure student growth. When the teachers were divided into two halves, according to students' growth in critical thinking, no statistically significant difference was identified between the groups in regard to the behaviors exhibited. Patelmo did note that "more effective" teachers of critical thinking demonstrated a difference in questioning techniques in comparison with "less effective" teachers. Patelmo concluded that the rigid curriculum utilized in the introductory physical science program resulted in insignificant variations in teacher behavior, thus preventing significant correlations with students' critical thinking growth.

Hall (1975) analyzed the effect of training teachers in the "Hilda Taba Program" of upper elementary social studies instruction. The object of the training was to increase the use of "supportive" instructional methods, e.g., teacher attempts to have students draw conclusions and make inferences from data. Among the researcher's hypotheses was the expectation that an increase in such "supportive" methods would result in a significant increase in secondary students' critical thinking ability as measured by the Watson-Glaser Critical Thinking Appraisal. Using audio-tapes to gather data and a modification of the Roberson Teacher Behavior Self-Analysis Instrument for analysis, Hall found that the Taba training program did significantly modify teacher behavior and resulted in the teachers' increased use of lessons to develop and encourage higher thinking skills and increased use of activities enabling pupils to practice and apply such higher levels of thinking. Achievement in elementary students (grades five-eight) was also pre- and post-tested using the

Metropolitan Achievement Test. No significant growth was found for the total group, but significant growth was found by isolating grades five and eight. No control group was utilized, and no data were gathered on academic or critical thinking growth by prior year students of the participating teachers.

Gregory and Casteel (1975) studied critical thinking growth, as measured by the Cornell Test of Conditional Reasoning, in eighth-grade mathematics and social studies classes. They collected data with regard to the verbal environment of the classroom using an interval observation system (Casteel and Stahl, 1973). They also determined the frequency with which teachers modeled conditional inferring.

Classes were observed three times over a five-month treatment period and a wide range of classroom behaviors correlated to the classes' growth scores. The results of their study are intriguing because they allow comparison of the same variables as manifested in two different subject areas. Among their findings are

1. Membership in mathematics classes in which teachers use high frequencies of conditional moves was found to be related positively with student growth in conditional reasoning ability.

2. The average frequency of conditional moves by teachers of mathematics was not found to be related to their average class gain in conditional reasoning ability.

3. The classroom verbal factors of wait-time and multiple reinforcement were found to be positively correlated to class conditional reasoning growth in mathematics classes.

4. The classroom verbal factors of student confusion, student insecurity of response, and teacher interruptive behaviors were found

to be negatively correlated to class conditional reasoning growth in mathematics classes.

5. The average frequency of conditional moves by teachers of social studies was found to be negatively correlated to average class gain in conditional reasoning ability.

6. The classroom verbal factor of wait-time was found to be positively correlated to class conditional reasoning growth in social studies classes.

It should be noted that only in item six, wait-time, was there consistency between the findings for mathematics classes and social studies classes.

The value of this study is the use of consistent instrumentation and techniques to examine the same variables in two different content areas. The ability to compare other research findings is hampered by the use of a variety of instruments and definitions for the variables. Although the loss of five of the original nine social studies teachers in this study may affect the validity of the findings by reason of experimental mortality, there appears to be adequate evidence to suspect that the verbal environment and the effects of the verbal environment differ in mathematics and social studies classes. One of the conclusions offered by the researchers, ". . . there appears to be a negative relationship between those student behaviors social studies teachers are trained to value and student growth in conditional reasoning ability" (p. 6), provides a stimulating research challenge for social studies educators.

The fourth group of studies focuses on a single aspect of classroom verbal processes and represents the largest category, with

one concentrating on teacher conditional behaviors and five concentrating on teacher questioning behaviors. The relationship between teacher conditional behaviors and student growth in conditional reasoning in seventh-grade mathematics classes was studied by Gregory (1972) using the Cornell Conditional Reasoning Test, Form X. Gregory divided the 20 teacher/classes into the top five users of the conditional move and the bottom five users of the conditional move. On the Cornell test, students with teachers who used a high frequency of conditional moves "out-performed" students in the classes where the conditional move was less frequently used.

Gallagher and Aschner (1963) conducted a study of productive thought processes in gifted children using an observation system based on Guilford's categories for intellectual operations. The researchers found that a correlation existed between teachers' divergent questions and students' divergent production. It was particularly noted that a small increase in divergent questions resulted in a large increase in divergent production.

Hunkins (1970) conducted a study to determine the effect of analysis and evaluation question on sixth-grade students' critical thinking development. Two sets of text-type materials were developed differing only in the types of questions being asked of the student. Students were exposed to the printed materials over a period of four weeks under conditions that reduced active teacher participation in the learning process. Pupils by class were randomly assigned to one of two treatment groups. Prior standardized test performance was reviewed to eliminate the possibility of significant differences in academic ability between the groups. Using the Social Studies

Inference Test as a pre- and posttest instrument, the researcher found that in the four sub-portions of the test

1. no significant difference occurred between the two treatment groups on inference;

2. significantly more caution was exhibited by students receiving the higher-order questions;

3. no significant difference occurred between the groups in the use of over-generalization; and

4. no significant difference occurred between the two groups in the skill of discrimination.

Hunkins concluded that, with minor exceptions, the use of analysis and evaluation questions had no significant effect on students' critical thinking ability. Statistical procedures did indicate variation based on the sex and the reading levels of the students involved. The appropriateness of the instrument used to test critical thinking and the decision to minimize student-teacher interaction were identified as possible factors in the failure to achieve significant results.

Beseda (1972) studied the effect of questioning on student achievement and critical thinking ability. Secondary social studies intern teachers were randomly assigned to a control group or an experimental group. Following assignment to classes in a metropolitan school system, the students assigned to the intern teachers were pre- and posttested using the Watson-Glaser Critical Thinking Appraisal, Iowa Tests of Educational Development, and the Sequential Tests of Educational Progress. Following the pretest, the experimental group interns received training in high-order questioning techniques, and posttraining observation was carried out to verify that this training

was effectuated in the classroom. The observation instrument confirmed an increase in the level of teacher questions, but the posttest results showed that the students of the control group teachers outperformed the students of experimental group teachers in the area of critical thinking. In analyzing the results, the author suggested that predicted results were not attained because the dependent variable did not measure convergent and divergent thinking.

Garris (1974) investigated the effect of teacher questions on secondary students' critical thinking ability in a variety of subject areas. Garris divided student teachers into three groups--two groups trained in questioning techniques and a control group. The author collected observational data using the Instructor Cognitive Operation Index. The Watson-Glaser Critical Thinking Appraisal was utilized to measure students' growth in critical thinking. Through the application of the Pearson product-moment coefficient of correlation, Garris found (1) a relationship between the "examinatory" mode of instruction and students' critical thinking ability, (2) a relationship between the use of higher level cognitive questions and the amount of increase in students' critical thinking ability, and (3) a relationship between teacher training in the "examinatory" mode and students' growth in critical thinking ability.

Adams (1974) investigated the effect of teacher questions on students' level of response and overall critical thinking development. In a summer program involving 14 classrooms and 303 students randomly assigned to experimental and control groups, the experimental group teachers were trained, through the use of Sanders' taxonomy of questions, to use higher order questions in classroom discourse.

Measurement of teacher interaction was accomplished through the Content Interaction Analysis System, and critical thinking growth was evaluated by the Sequential Tests of Educational Progress: Social Studies, Form 4A. Adams found no significant difference in critical thinking gain between the control group and the experimental group. Adams did report what he believed was an identifiable trend between higher order questions and critical thinking gain. He did find that experimental group students demonstrated a significant increase in cognitive response levels over control group students.

Instructional Process and Direct Instruction

The issue of how a combination of curriculum and process affects student growth in critical thinking has been the subject of three studies. Anderson, Marcham, and Dunn (1944) of the Cornell Critical Thinking Project conducted an early experimental study focusing on seven specific thinking skills:

1. identifying specific facts,
2. selecting relevant facts,
3. organizing facts in terms of meaningful sub-topics,
4. arranging sub-topics in logical order,
5. making inferences from specific facts and from trends,
6. distinguishing between facts and opinions, and
7. recognizing situations in which insufficient evidence makes it difficult or impossible to draw a clear-cut conclusion.

Instruction, materials, and procedures involving "doing" or "telling" approaches were developed for use in both 7th-grade and 10th-grade

social studies classes, and special instruments were developed and tested for validity and reliability. Fifty-two matched classes in the states of New York and Iowa utilized the instructional program between September and April of 1940-41. Brief observations and interviews were scheduled by two research assistants to determine the use of the program and obtain information on teacher and student reactions. Although different classes varied drastically in "doing" or "telling" formats, the overall gain averages showed no significant difference in either approach. The use of a control group appeared to be an afterthought, and little discussion of procedure was provided. The authors found that the total experimental group did significantly better than a control group on Test II, which measured drawing conclusions. Both the experimental students and the control group performed almost equally on Test I which measured the abstraction and organization of knowledge.

Saadeh (1962) studied the effectiveness of teaching for critical thinking in the sixth grade. Using a definition of critical thinking as a careful examination and evaluation of a product of thought, whether it was a result of inductive discovery or of deductive proof, Saadeh paired 30 classes in different schools in order to reduce variance. The classes were randomly assigned to control and experimental groups. Students in the experimental classes received inductive teaching on each of four skills of critical thinking. The author found a significant improvement in the experimental group at the .01 level.

Hyram (1957) attempted to improve the ability of upper elementary school children to think critically by improving their ability to

think logically. Using a definition "that thinking is critical when it is essentially logical" (p. 125), the author inductively instructed an experimental group on seven concepts of logical thinking for a period of four months while the control group was taught by their regular teachers. A test developed by the author was used for pre- and posttesting and showed significant growth by the experimental group. Evaluation of I.Q. levels, mental ages, language levels, and reading levels of the two groups led the author to eliminate these as possible factors in causing the variation in the scores. The limited definition applied to critical thinking and the lack of description regarding the reliability and validity of the test instrument reduced the value of this study.

In conclusion, where empirical investigations have been attempted, insignificant findings have been the rule. Furthermore, explanations read more like apologies than hypotheses. This raises the question as to why such results have been consistent. A number of suggestions have been proferred:

1. Critical thinking has not been defined consistently nor its attributes agreed upon (Beyer, 1985b; Chapin & Gross, 1973; Goldmark, 1966; Leef, 1968; Oliver & Shaver, 1966; Skinner, 1971; Taba, 1950).

2. Appropriate practice has not been provided (Bostwick et al., 1953; Goodson, 1939; Hunkins, 1970; Morse & McCune, 1971; Skinner, 1971; Taba, 1950).

3. Direct instruction has not been provided (Aylesworth & Reagan, 1969; Bostwick et al., 1953; Goodson, 1939; Hudgins, 1971; Taba, 1967; Wallen, Haubrich, & Reid, 1963).

4. Teacher questioning techniques were not at an appropriate level to stimulate thinking (Cunningham, 1968; Ellis, 1942; Taba, Levine, & Elzey, 1964).

5. Teachers did not model thinking behavior appropriately (Green, 1971; Hudgins, 1971; Starr, 1963).

Summary

The purpose of this investigation was to explore relationships between specific categories of teacher verbal behavior and student growth in conditional reasoning ability in social studies classes. Research on teacher verbal behavior has provided indicators that specific behaviors are related to positive and negative student achievement. Research on critical thinking, however, has failed to provide adequate guidance on the practices which result in conditional reasoning growth. Two studies directly relevant to the current problem have been identified (Gregory, 1972; Gregory & Casteel, 1974). These studies demonstrated consistent results in both seventh- and eighth-grade mathematics classes, but found results for eighth-grade social studies classes that were usually contradictory to those reported for mathematics classes.

CHAPTER 3
METHODOLOGY

The purpose of this study was to explore relationships between specific categories of teacher verbal behavior and student growth by class in conditional reasoning in seventh-grade social studies classes. This chapter describes

1. the population and sample used in the study,
2. the variables and related instrumentation used in measurement,
3. the design and data collection procedures,
4. the hypotheses to be tested, and
5. the statistical treatment of the data.

Population and Example

A sample of convenience was utilized from among the classes of 17 teachers of seventh-grade geography, a required course in the 6 middle schools in a Southwest Florida school district. Students in the classes were heterogeneously grouped with the exception of students who were staffed into the exceptional student education program. Of the 17 possible participants, 3 requested not to participate because they were teaching out-of-field, and 1 failed to complete the audiotaping schedule. Consequently, 13 teachers/classes from 6 schools and 242 students were included in the study.

Variables

The two main variables examined in this study were frequency of teacher presentation behaviors and mean student growth by class in conditional reasoning ability. These variables are best defined and explained in terms of the instrumentation used in measurement.

Teacher presentation behaviors are those verbal behaviors utilized by teachers in the development of skills, information, and value in students. The Technical Skills Observation Schedule (Casteel and Gregory, 1979) was used in order to determine the frequency of teacher presentational behaviors. Five moves are categorized as functional teacher moves--structuring, conditional, wait-time, probing, and reacting. Two moves are labeled as dysfunctional moves--obstructive and inhibiting. The moves are subdivided into 51 behaviors, termed "instances," with operational definitions and examples provided (see Figure 1). All seven moves were employed in the analysis of data.

The structuring, conditional, probing, reacting, obstructive, and inhibiting moves were coded by a trained coder from audio-tape transcripts of the classes sampled. Reliability of the coder in the investigation was established through the use of an inter-rater reliability formula. Two trained coders analyzed the same sample transcript, and agreement was computed using the inter-rater reliability formula, agreement = $\frac{A - B}{A + B}$, developed by Emmer and Millet (1970), and used by Good and Brophy (1973). The agreement percentages

Moves	Behaviors
Structuring Move	Lesson Set
	Internal Set
	Lesson Closure
	Internal Closure
	Preset Closure
	Indicative Statement
	Focal Solicitation
	Focal Explanation
	Contextual Solitication
	Contextual Explanation
Conditional Move	Cued Solitication
	Cued Explanation
	Linked Solicitation
	Linked Explanation
	Conditional Statement
	Hypothetico-Deductive Solititation
	Hypothetico-Deductive Explanation
Wait-Time Move	Pausing
	Response Time
	Reflection Time I
	Reflection Time II
	Study Time
Probing Move	Minimal Reinforcement
	Minimal Criticism
	Puzzlement
	Explanatory/Clarification
	Reconstruction
	Relational
	Justification
	Redirection
	Miscellaneous
Reacting Move	Multiple Reinforcement
	Reinforcement Plus Criticism
	Reinforcement Plus Grounds
	Reinforcement Plus Integration
	Citation Plus Reinforcement
	Verbal Marker
	Citation Plus Accommodation
	Multiple Citation

Figure 1. Components of the Technical Skill Observation Schedule (Casteel & Gregory, 1979).

Moves	Behaviors
Obstructive Move	Designated Solicitation
	Post Question Structuring
	Multiple Solicitation
	Student-Expressed Confusion
	Internal Disruptive
	External Disruptive
Inhibiting Move	Teacher Interruptive
	Student Interruptive
	Excessive Criticism
	Teacher Ridicule
	Student Ridicule

Figure 1. continued

are reported below. The wait-time move was timed directly from the tapes.

Move	% Agreement
Structuring	99%
Conditional	97%
Probing	96%
Reacting	86%
Obstructive	100%
Inhibiting	100%

Student growth by class was measured using the Cornell Conditional Reasoning Test, Form, X, developed by R.H. Ennis et al. (1964). The test consists of 72 items with 6 items used to test each of 12 principles of conditional logic. The 12 principles are presented in Figure 2. For purposes of this study, only the total score was utilized.

Design and Data Collection Procedure

A standard correlation design was used to determine the relationships between the two variables. Data collection began on the ninth day of school at the beginning of the fall semester. This allowed student schedules to stabilize and minimized subject mortality between pre- and posttesting. The Cornell Conditional Reasoning Test, Form X, was administered to all participating classes on September 1 and again on November 29 as a posttest. Hence, the treatment period was 11 weeks.

Structure	Answer
1. If p, then q. p. Therefore q.	Yes

Given an if-then sentence, the affirmation of the if-part implies the affirmation of the then-part.

2. If p, then q. Not p. Therefore not q.	Maybe

Given an if-then sentence, the denial of the if-part does not by itself imply the denial of the then-part.

3. If p, then q. q. Therefore p.	Maybe

Given an if-then sentence, the affirmation of the then-part does not by itself imply the affirmation of the if-part.

4. If p, then q. Not q. Therefore not p.	Yes

Given an if-then sentence, the denial of the then-part implies the denial of the if-part.

5. If p, then q. If q, then r. Therefore, if p, then r.	Yes

The if-then relationship is transitive.

6. If p, then q. Therefore, if not q, then not p.	Yes

An if-then sentence implies its contrapositive.

7. If p, then q. Therefore, if q, then p.	Maybe

The if-then relation is non-symmetric.

Figure 2. Item Structure and Conditional Logic Principles Utilized in the Cornell Conditional Reasoning Test, Form X. Adapted from Ennis et al. (1964) and Gregory (1972, p. 49)

	Structure	Answer
8.	p only if q. Not q. Therefore not p.	No

Given an only-if sentence, the denial of the only-if part implies the denial of the major part.

9.	p only if q. p. Therefore q.	Yes

Given an only-if sentence, the affirmation of the major part implies the affirmation of the only-if part.

10.	p, if, and only if, q. Not p. Therefore not q.	Yes

The denial or affirmation of one part of an if-and-only-if statement implies respectively the denial or affirmation of the other part.

11.	p only if q. q. Therefore p.	Yes

Given an only-if statement, the affirmation of the only-if part does not by itself imply the affirmation of the major part.

12.	p only if q. Not p. Therefore not q.	Maybe

Given an only-if sentence, the denial of the major part does not by itself imply the denial of the only if-part.

Figure 2. continued

Three time periods were designated during the 11 weeks in which teachers were required to audio-tape a "typical" lesson. This procedure allowed teachers to select lessons which, in their opinion, constituted "good teaching." The audio-tapes were transcribed by a professional secretary and the transcription verified by the researcher. A sample transcript is provided in Appendix C. Prior to coding, the transcripts were scrambled in order to prevent the possibility that the coder would generalize from one lesson to other lessons. The transcripts were then coded using the Technical Skills Observation Schedule to establish the frequency of teaching behaviors.

Hypotheses

The following null hypotheses were generated for use in data analysis and interpretation:

1. Teachers of seventh-grade geography do not use the moves of structuring, conditional, wait-time, probing, reacting, obstructive, or inhibiting.

2. No linear relationship exists between the frequency of teacher structuring moves and regressed student gain scores in conditional reasoning.

3. No linear relationship exists between the frequency of teacher conditional moves and regressed student gain scores in conditional reasoning.

4. No linear relationship exists between the frequency of teacher wait-time moves and regressed student gain scores in conditional reasoning.

5. No linear relationship exists between the frequency of teacher probing moves and regressed student gain scores in conditional reasoning.

6. No linear relationship exists between the frequency of teacher reacting moves and regressed student gain scores in conditional reasoning.

7. No linear relationship exists between the frequency of teacher obstructive moves and regressed student gain scores in conditional reasoning.

8. No linear relationship exists between the frequency of teacher inhibiting moves and regressed student gain scores in conditional reasoning.

An a priori .05 level of statistical significance was used to test these hypotheses.

Statistical Treatment of the Data

1. A regressed gain score was computed for each student. This was achieved by calculating a posttest score for a student on the basis of his/her pretest score. The student's regressed gain score was calculated as posttest minus predicted posttest scores.

2. A class gain score was used in correlational analysis. The gain score was the mean of the students' regressed gain scores in that class.

3. Linear relationships were determined using the Pearson product moment correlation formula.

Summary

A correlational study was conducted on the relationships between each teacher move in the Technical Skill Observation Schedule and conditional reasoning growth by students in seventh-grade geography classes in a Southwest Florida county during the fall semester. A sample of convenience was used to identify classes/teachers. Students were pretested and posttested using the Cornell Conditional Reasoning Test, Form X, to determine critical thinking growth. Teachers audio-taped three classes during designated time periods spread over the 11-week treatment period. The tapes were transcribed by a trained secretary. These transcriptions were coded by a trained analyst. A Pearson product moment correlation was computed for the mean and median frequencies of teacher moves and class growth scores.

CHAPTER 4
RESULTS

This chapter reports data obtained through the application of the Cornell Conditional Reasoning Test, Form X, the Technical Skills Observation Schedule, and the results of the analysis of those data.

The Cornell Conditional Reasoning Test, Form X, was administered as a pre- and posttest with an intervening 11-week treatment period during which the teaching behaviors associated with each teacher would have an opportunity to effect change. Table 4-1 reports class means and standard deviations of the pretest, posttest, and growth scores (raw score data are reported in Appendix Table A-1). The total growth mean for all 242 students was 1.6902. Growth means varied from a high of 3.3971 to a low of -3.8152. Fewer than half of the classes had positive mean growth scores with a range from .4822 to 3.3971. The seven with negative growth ranged from -.5428 to -3.8512.

Tables 4-2 and 4-3 report each teacher's mean and median frequency, respectively, for each of the seven TSOS moves over the three recorded lessons. The actual frequency for each teacher on each observation is reported in Table 4-4. The original design for the study focused on the use of the mean move frequency for teachers on each move. However, on the basis of wide fluctuation for given teachers with regard to specific moves, the median move frequency was considered a viable measure and has been included.

Table 4-1

Pretest, Posttest, and Growth Mean Performance on the Cornell Conditional Reasoning Test, Form X, by Class

	Pretest		Posttest		Growth	
Teacher #	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
1. (n=22)	34.3640	6.3999	38.4550	6.1771	0.4822	4.7517
2. (n=15)	27.8670	5.7256	30.6000	5.3516	-3.8512	4.7436
3. (n=18)	35.1110	6.4884	37.3890	6.7259	-0.9886	4.6193
4. (n=19)	36.6840	6.3994	41.1050	5.4182	1.8752	4.0732
5. (n=12)	34.2500	8.9454	40.1670	7.4591	2.2559	5.0172
6. (n=24)	37.2920	7.3820	38.5000	8.2209	-1.0593	6.1903
7. (n=17)	35.3530	7.6998	36.1180	9.8212	-1.3069	7.6823
8. (n=15)	24.3330	5.0553	35.9330	5.3225	3.3971	5.5910
9. (n=16)	30.2500	7.2930	38.5630	6.3833	2.8196	6.0501
10. (n=21)	24.2380	8.3547	33.3810	7.6686	0.8964	6.1402
11. (n=24)	39.0830	6.3437	39.0000	6.2915	-1.5303	4.6762
12. (n=20)	36.8000	7.7949	38.7500	9.4598	-0.5428	8.2815
13. (n=19)	37.3684	5.6588	38.6840	5.4488	-0.9167	4.6504
Total (n=242)	33.5450	8.4668	37.5289	7.5603	1.6902	6.0084

Table 4-2

Mean Move Frequency by Teachers Over Three Observations

Teacher #	Structuring	Conditional	Wait-Time	Probing	Reacting	Obstructive	Inhibiting
1	15.00	9.33	16.33	28.00	3.33	33.00	1.33
2	38.00	40.33	8.67	20.67	7.00	29.33	.00
3	13.33	20.00	10.67	6.33	1.67	25.00	1.00
4	9.33	28.67	3.67	5.33	2.00	17.00	1.33
5	15.00	15.00	10.00	14.00	1.00	19.00	1.67
6	15.33	12.00	12.33	5.00	2.67	8.33	.00
7	21.33	15.33	18.00	22.00	2.67	47.67	.33
8	4.67	15.67	8.33	4.67	2.00	15.00	8.67
9	13.00	15.00	7.00	13.33	2.00	22.00	1.00
10	8.00	7.67	4.67	4.67	.67	17.67	.33
11	3.33	8.00	5.33	.00	.00	5.67	.00
12	4.00	11.67	9.67	5.67	1.67	17.00	1.00
13	20.00	25.00	18.67	11.00	1.33	23.33	1.33

Table 4-3

Median Move Frequency by Teachers Over Three Observations

Teacher #	Structuring	Conditional	Wait-Time	Probing	Reacting	Obstructive	Inhibiting
1	18	4	19	25	4	40	2
2	44	42	10	17	8	28	0
3	19	22	10	8	1	16	0
4	8	30	4	6	2	14	2
5	21	20	7	15	1	21	2
6	15	11	13	6	2	4	0
7	20	15	17	19	2	53	0
8	6	9	10	1	0	15	4
9	14	17	5	13	2	18	1
10	8	6	4	6	1	16	0
11	3	8	6	0	0	5	0
12	5	8	6	4	2	9	1
13	18	24	17	11	1	26	2

Table 4-4

Teacher Moves for Each Observation

	Structuring	Conditional	Wait-Time	Probing	Reacting	Obstructive	Inhibiting
Teacher 1							
1	18.00	3.00	24.00	25.00	5.00	15.00	0.00
2	18.00	21.00	19.00	42.00	2.00	44.00	2.00
3	9.00	4.00	6.00	17.00	4.00	40.00	2.00
Mean	15.00	9.33	16.33	28.00	3.33	33.00	1.33
Median	18.00	4.00	19.00	25.00	4.00	4.00	2.00
Teacher 2							
1	24.00	34.00	13.00	17.00	8.00	28.00	0.00
2	44.00	45.00	10.00	14.00	9.00	34.00	0.00
3	46.00	42.00	3.00	31.00	4.00	26.00	0.00
Mean	38.00	40.22	8.67	20.67	7.00	29.33	0.00
Median	44.00	42.00	10.00	17.00	8.00	28.00	0.00
Teacher 3							
1	19.00	33.00	16.00	11.00	4.00	59.00	3.00
2	1.00	5.00	10.00	0.00	0.00	0.00	0.00
3	20.00	22.00	6.00	8.00	1.00	16.00	0.00
Mean	13.33	20.00	10.67	6.33	1.67	25.00	1.00
Median	19.00	22.00	10.00	8.00	1.00	16.00	0.00
Teacher 4							
1	13.00	30.00	4.00	4.00	0.00	11.00	2.00
2	8.00	24.00	2.00	6.00	2.00	26.00	2.00
3	7.00	32.00	5.00	6.00	4.00	14.00	0.00
Mean	9.33	28.67	3.67	5.33	2.00	17.00	1.33
Median	8.00	30.00	4.00	6.00	2.00	14.00	2.00
Teacher 5							
1	21.00	20.00	6.00	2.40	1.00	25.00	0.00
2	22.00	23.00	17.00	15.00	0.00	21.00	3.00
3	2.00	2.00	7.00	3.00	2.00	11.00	2.00
Mean	15.00	15.00	10.00	14.00	1.00	19.00	1.67
Median	21.00	20.00	7.00	15.00	1.00	21.00	2.00

Table 4-4

continued

	Structuring	Conditional	Wait-Time	Probing	Reacting	Obstructive	Inhibiting
Teacher 6							
1	15.00	17.00	13.00	7.00	6.00	17.00	0.00
2	18.00	11.00	6.00	6.00	2.00	4.00	0.00
3	13.00	8.00	18.00	2.00	0.00	4.00	0.00
Mean	15.33	12.00	12.33	5.00	2.67	8.33	0.00
Median	15.00	11.00	13.00	6.00	2.00	4.00	0.00
Teacher 7							
1	25.00	15.00	17.00	32.00	5.00	53.00	0.00
2	20.00	12.00	13.00	15.00	2.00	34.00	0.00
3	19.00	19.00	24.00	19.00	1.00	56.00	1.00
Mean	21.33	15.33	18.00	22.00	2.67	47.67	0.33
Median	20.00	15.00	17.00	19.00	2.00	53.00	0.00
Teacher 8							
1	8.00	33.00	15.00	12.00	6.00	24.00	19.00
2	6.00	9.00	10.00	1.00	0.00	15.00	4.00
3	0.00	5.00	0.00	1.00	0.00	6.00	3.00
Mean	4.67	15.67	8.33	4.67	2.00	15.00	8.67
Median	6.00	9.00	10.00	1.00	0.00	15.00	4.00
Teacher 9							
1	7.00	17.00	4.00	7.00	2.00	18.00	0.00
2	18.00	19.00	5.00	13.00	4.00	32.00	2.00
3	14.00	9.00	12.00	20.00	0.00	16.00	1.00
Mean	13.00	15.00	7.00	13.33	2.00	22.00	1.00
Median	14.00	17.00	5.00	13.00	2.00	18.00	1.00
Teacher 10							
1	5.00	6.00	7.00	6.00	0.00	12.00	0.00
2	8.00	6.00	4.00	6.00	1.00	16.00	0.00
3	11.00	11.00	3.00	4.00	1.00	25.00	1.00
Mean	8.00	7.67	4.67	4.67	0.67	17.67	0.33
Median	8.00	6.00	4.00	6.00	1.00	16.00	0.00

Table 4-4

continued

	Structuring	Conditional	Wait-Time	Probing	Reacting	Obstructive	Inhibiting
Teacher 11							
1	3.00	8.00	3.00	0.00	0.00	5.00	0.00
2	3.00	6.00	6.00	0.00	0.00	7.00	0.00
3	4.00	10.00	7.00	0.00	0.00	5.00	0.00
Mean	3.33	8.00	5.33	0.00	0.00	5.67	0.00
Median	3.00	8.00	6.00	0.00	0.00	5.00	0.00
Teacher 12							
1	5.00	7.00	2.00	1.00	2.00	9.00	0.00
2	7.00	20.00	21.00	12.00	3.00	38.00	2.00
3	0.00	8.00	6.00	4.00	0.00	4.00	1.00
Mean	4.00	11.67	9.67	5.67	1.67	17.00	1.00
Median	5.00	8.00	6.00	4.00	2.00	9.00	1.00
Teacher 13							
1	17.00	24.00	17.00	4.00	2.00	26.00	2.00
2	18.00	30.00	8.00	18.00	1.00	26.00	0.00
3	25.00	21.00	31.00	11.00	1.00	18.00	2.00
Mean	20.00	25.00	18.67	11.00	1.33	23.33	1.33
Median	18.00	24.00	17.00	11.00	1.00	26.00	2.00
Total Move Frequency	541.00	671.00	400.00	424.00	85.00	840.00	54.00
Total Mean Frequency	41.62	51.62	30.77	32.62	6.54	64.62	4.15

As illustrated by Table 4-2, the range of mean move frequencies for specific moves varied from a high of 42 for the obstructive move to a low use of 7 for the reacting move. The move most commonly used by teachers was the obstructive move while the move least used was the inhibiting move. The mean frequency of moves used by specific teachers varied considerably. Teacher 7 had a high range of 47.34 between most common and least common moves. Teacher 11 had a low range of 8.0 between most and least common moves.

The median move frequency by teachers reported in Table 4-3 provides a slightly different profile of teacher behaviors. The range of median move frequencies for specific moves varied from a high of 49 on the obstructive move to 4 on the inhibiting move. The median move frequency among the teachers in the study varied from a high range of 53 for Teacher 7 to a low of 8 for Teachers 11 and 12.

A significant negative correlation (-.5767) was found between regressed conditional reasoning growth and the mean frequency of the structuring move. The correlation with the median frequency of the structuring move was not found to be significant. Both the mean and median frequency of the inhibiting move had a positive significant correlation with growth in conditional reasoning.

Hypotheses

Hypothesis 1. Teachers of seventh-grade geography do not use the moves of structuring, conditional, wait-time, probing, reacting, obstructive, or inhibiting. This hypothesis can be rejected based on

the data reported in Table 4-4. The teacher population involved in the study used 541 structuring moves ($\bar{x}$ = 41.62), 671 conditional moves ($\bar{x}$ = 51.62), 400 wait-time moves ($\bar{x}$ = 30.77), 424 probing moves ($\bar{x}$ = 32.62), 85 reacting moves ($\bar{x}$ = 6.54), 840 obstructive moves ($\bar{x}$ = 64.62), and 54 inhibiting moves ($\bar{x}$ = 4.15).

Hypothesis 2. No linear relationship exists between the frequency of teacher structuring moves and regressed student gain scores in conditional reasoning. As reported in Table 4-5, the coefficient of correlation between the mean frequency of teacher structuring moves and mean regressed gain in student conditional reasoning is r = -.5767 which is significant at the .05 level. The null hypothesis is rejected for the mean frequency. The same result was not found for the relationship between gain scores and median frequencies.

Hypothesis 3. No linear relationship exists between the frequency of teacher conditional moves and regressed student gain scores in conditional reasoning. As indicated in Table 4-5, the correlation between student critical thinking growth and the mean and median frequency of teacher use of conditional moves was not found to be significant; therefore, the null hypothesis cannot be rejected.

Hypothesis 4. No linear relationship exists between the frequency of teacher wait-time moves and regressed student gain scores in conditional reasoning. As indicated in Table 4-5, the correlation between student conditional reasoning growth and the mean and median frequency of teacher use of conditional moves was not found to be significant; therefore, the null hypothesis cannot be rejected.

Table 4-5

Coefficient of Correlation between Mean Growth and Mean and Median Teacher Move Frequencies

Move	Mean	Median
Structuring	r = -.5767*	r = -.5262
Conditional	r = -.3513	r = -.3388
Wait-Time	r = -.3067	r = -.3363
Probing	r = -.1786	r = -.1618
Reacting	r = -.4675	r = -.5264
Obstructive	r = -.2283	r = -.1632
Inhibiting	r = .6093*	r = .6951*

*P < .05

Hypothesis 5. No linear relationship exists between the frequency of teacher probing moves and regressed student gain scores in conditional reasoning. As indicated in Table 4-5, the correlation between student conditional reasoning growth and the mean and median frequency of teacher use of probing moves was not found to be significant; therefore, the null hypothesis cannot be rejected.

Hypothesis 6. No linear relationship exists between the frequency of teacher reacting moves and regressed student gain scores in conditional reasoning. As indicated in Table 4-5, the correlation between student conditional reasoning growth and the mean and median frequency of teacher use of obstructive moves was not found to be significant; therefore, the null hypothesis cannot be rejected.

Hypothesis 7. No linear relationship exists between the frequency of teacher obstructive moves and regressed student gain scores in conditional reasoning. As indicated in Table 4-5, the correlation between student conditional reasoning growth and the mean and median frequency of teacher use of obstructive move was not found to be significant; therefore, the null hypothesis cannot be rejected.

Hypothesis 8. No linear relationship exists between the frequency of teacher inhibiting moves and regressed student gain scores in conditional reasoning. As indicated in Table 4-5, the correlation between student conditional reasoning growth and the mean frequency of teacher use of inhibiting moves is $r = .6093$ and for the median frequency of teacher utilization is $r = .6951$. Both figures are significant at the .05 level; hence, the null hypothesis is rejected.

Summary

The Cornell Conditional Reasoning Test, Form X (CCRT), was administered as a pre- and posttest in 13 classes with an intervening 11-week treatment period during which each teacher's lessons were recorded three times and coded using the Technical Skills Observation Schedule (TSOS). Although a net raw score gain on the CCRT occurred in 12 of the 13 classes, little gain was detected after regression techniques were used to establish standard growth scores.

Both mean and median move frequencies for each of the seven moves on the TSOS were computed and correlated to mean regressed student gain scores on the CCRT. A significant (.05) negative correlation was found between mean regressed student gain scores and mean teacher use of the structuring move. A significant positive correlation (.05) was found between mean regressed student gain scores and both mean and median frequencies of the inhibiting move.

As a result of the data reported, Hypotheses 1, 2, and 8 were rejected for mean frequencies. Hypotheses 1 and 8 were rejected for median frequencies.

CHAPTER 5
SUMMARY AND CONCLUSION

This study investigated possible correlates between seven teacher moves embracing 51 discreet behaviors and seventh-grade social studies students' regressed gain scores in conditional reasoning ability. A Pearson product moment correlation was utilized to identify significant relationships between the mean and median frequency of teacher moves and their students' mean class gain in conditional reasoning ability.

Seventeen teachers of seventh-grade geography were identified as a sample of convenience, and 13 of the teachers completed the requirements for participation in the study. Students in one randomly selected class for each teacher were pretested using the Cornell Conditional Reasoning Test, Form X, on the ninth day of school. Teachers submitted three audio-tapes of lessons taught to the target classes during three designated time periods. After an 11-week treatment period the CCRT was administered to the same classes as a posttest.

The audio-tapes were transcribed and coded using the Technical Skills Observation Schedule. Mean and median frequencies of the seven moves in the TSOS were computed for each teacher and correlated to mean regressed growth in conditional reasoning using a Pearson product moment correlation.

Qualifications

Before interpreting the data in terms of statistical results and relating these results to other research, attention should be drawn to two elements of this study which contribute to misinterpretation and account for variances between the study and parallel research.

1. The data-gathering technique of having teachers audio-tape their own lessons within a designated time period may have resulted in atypical data regarding the frequency of behaviors used by the teachers. Although it was assumed that teachers would select normal or their best lessons for taping, the lessons may be skewed to emphasize behaviors they perceived to be valued by the researcher. To prevent this occurrence no communication was allowed regarding the behaviors being studied and the fact of a posttest was not communicated until after all tapes had been completed.

2. The statistical procedures used in the study, although appropriate for the design, have a tendency to wash out possible real impact on individual critical thinking growth. Variance within a class became a negligible factor through the use of mean regressed gain scores. If the raw growth scores exhibited by the majority (165 of 242) were utilized, different patterns of relationships might have emerged. To reiterate, the loss of intra-class variance, which was large, resulting from the use of mean class growth, suggests that straightforward interpretations of correlations are not warranted. This was particularly emphasized by the small degree to which any class of students exhibited gain in conditional reasoning and the high standard deviations--8.4668 pretest, 7.5603 posttest, and 6.0084

growth. Such mediating factors must be kept in mind as the interpretation is presented.

Interpretation of Results

Hypothesis 1. Teachers of seventh-grade geography do not use the moves of structuring, conditional, wait-time, probing, reacting, obstructive, or inhibiting.

In contradiction to the hypothesis, teachers of seventh-grade geography were found to use the designated moves. The mean move utilization for the average teacher ranged from a high of 21.54 for obstructive moves to a low of 1.38 for inhibiting moves. The high frequency of obstructive moves, categorized as dysfunctional in the TSOS, is dismaying to this investigator but is not inconsistent with earlier research. Gleason (1978), in a study of preservice English, mathematics, and social studies teachers in secondary schools, also reported obstructive moves as the most frequent behavior and inhibiting moves as the least frequent; however, after initial growth, this behavior tended to diminish in the Gleason example.

The relationship between the mean frequency of moves by Gleason's student teacher population and those experienced teachers in the current study is interesting to note and is illustrated below:

Move	Student Teacher	Experienced Teacher
Structuring	9.6	13.9
Conditional	6.1	17.2
Wait-Time	17.5	10.3
Probing	11.8	10.9
Reacting	7.6	2.2
Obstructive	17.8	21.5
Inhibiting	4.2	1.4

The viewpoint that teachers, as they gain teaching experience, increase their use of functional behaviors and decrease their use of dysfunctional behaviors is not supported in this comparison. The experienced teachers demonstrated a lower frequency of wait-time, probing, and reacting moves than the student teachers while demonstrating a higher mean frequency of dysfunctional obstructive moves.

Hypothesis 2. No linear relationship exists between the frequency of teacher structuring moves and regressed student gain scores in conditional reasoning.

This hypothesis can be rejected with qualification. As reported in Chapter 4, a significant linear relationship ($r = -.5767$) was found between the mean frequency of teacher structuring moves and student regressed gain in conditional reasoning. This was not found when median frequencies were used. Although a relationship was anticipated by the researcher, the negative, as opposed to positive correlation, was not expected.

Previous discussion of research on the structuring move has indicated a relationship between structuring and student achievement. With the exception of the Gregory and Casteel (1975) study, however, conditional reasoning was not the focus of student performance. Gregory and Casteel, using the Social Science Observation Record (Casteel & Stahl, 1973) to analyze classroom verbal behavior, found that teachers did not employ the structuring move in order to stress either the factual information associated with the content or the student verbal behaviors associated with the conceptual analysis of those data. Had the teachers in the current study been analyzed in

this way, it might have been shown that they demonstrated a prevailing pattern associated both with those in the Gregory and Casteel study and with social studies teachers in general.

Gregory and Casteel further reported that

> . . . there appears to be a negative relationship between those student behaviors social studies teachers are trained to value and student growth in conditional reasoning ability. (1975, p. 8)

If the classrooms in this study had been coded using the TSOS, they might have made similar conclusions regarding valued teacher behaviors.

If directness is equated with structuring, Miller's (1966) study of junior high students reported in the literature review of critical thinking supports the results of the current study. Armstrong (1970) and Measel and Mood (1972) also postulated that indirect teaching (low structure) was positively correlated to critical thinking growth although no significant findings resulted from their studies. The phenomenon is promoted in an extensive body of literature arguing for indirect as opposed to direct teaching techniques. In the view of the proponents of indirect teaching, students are enabled to become more actively involved in the teaching-learning process, and the lack of structure forces the employment of thinking/reasoning skills. The problem is that if one were to accept this, then one would be linking teacher structuring with teacher directness and teacher failure to structure with teacher indirectness.

Hypothesis 3. No linear relationship exists between the frequency of teacher conditional moves and regressed student gain scores in conditional reasoning.

The data reported in Chapter 4 support this null hypothesis. Not only was there no significant relationship evidenced by the data but the direction of the influence was that of a negative correlation. This result, although contradictory to the researcher's expectations, amplified the Gregory and Casteel (1975) study of eighth-grade mathematics and social studies students. Although Gregory (1972) and Gregory and Casteel (1975) reported a positive relationship between the frequency of teacher conditional moves and student growth in logical reasoning in mathematics classes, the latter study found a negative correlation between teacher conditional moves and students' logical reasoning growth in social studies classes. In an explanation of the results, it was suggested that the use of teacher conditional moves in mathematics classes is related to a decrease in dysfunctional student behaviors which correlated negatively with logical reasoning growth. In social studies classes the use of conditional moves by teachers did not correlate with a decrease in dysfunctional student moves.

An alternate hypothesis to consider focuses on the distinction between teacher explanation using conditionals and teacher questioning using conditionals. There may be a positive linear relationship between teacher conditional solicitations and student growth in conditional reasoning. Neither Gregory's study nor the Gregory and Casteel study distinguished between conditional solicitations and conditional explanation in the conditional behaviors used by teachers.

A re-analysis of the conditional moves utilized by the teachers in this study was performed. Teachers were found to have used 123 solicitations as opposed to 568 explanations/statements. Hence students practiced conditional thinking for 22% of the occasions perceived to be relevant in the classroom, whereas the teachers practiced conditional thinking for 78% of the time. Furthermore, although social studies teachers in this study used conditional discourse in explaining subject matter, they did not frequently utilize conditional moves in structuring questions.

One could postulate that in social studies classes students may have frequent opportunity to see reasoning being demonstrated but few opportunities to rehearse the behavior themselves. In explaining the different results for mathematics teachers reported by Gregory and Gregory and Casteel, one could postulate that in mathematics classes, teachers provide students with an opportunity not only to see the behavior demonstrated but to practice the behavior within the context of the subject matter.

The possibility that students are not receiving time to practice conditional thinking is critical for possibilities concerning other teacher variables. The strength of this possibility will become more apparent as the wait-time, probing, and reacting moves are discussed.

Hypothesis 4. No linear relationship exists between the frequency of teacher wait-time moves and regressed student gain scores in conditional reasoning.

The data reported in Chapter 4 support this null hypothesis. This result was contrary to both the researcher's expectations and the

study by Gregory and Casteel (1975) referenced earlier. It was, however, congruent with Lake's (1973) research. With the exception of Gregory and Casteel, no identified research has shown a significant linear relationship between the variables. The results of work in this area, however, have shown that student behavior changes do tend to occur with the effective use of wait-time. Several of the behaviors, i.e., increase in the incidence of speculative thinking, increase in student-to-student comparing (Rowe, 1974), and increase in cognitive complexity in student responses (Lake) would appear to have a relationship to a student increase in conditional reasoning skills.

Possible explanations of the failure of this study to identify a linear relationship relate to the low frequency of wait-time use by the teachers involved and the incidence of specific behaviors within the wait-time move. The mean frequency of wait-time use was not reported in the Gregory and Casteel study; however, as was noted in the discussion related to Hypothesis 1, the mean frequency of wait-time moves in this study was lower than that identified for student teachers reported by Gleason (1978). There may be a minimum frequency necessary in order to generate a measurable effect on student conditional reasoning ability.

The second factor is the use of specific behaviors within the wait-time move. Mary Budd Rowe has conducted the most extensive research on wait-time and emphasizes the intervals between teacher talk and student talk and between student talk and teacher talk. This corresponds to response time and reflection time II in the TSOS

coding. An examination of these behaviors shows that the mean frequency for a lesson by teachers in the current study was 3.21 for response time and .33 for reflection time II. This pattern should not result in a significant positive correlation with conditional reasoning. The higher incidence of the less influential pausing ($\bar{x}$ = 3.67) and study time ($\bar{x}$ = 2.94) moves may have created a total mean for the wait-time move which, when correlated to conditional reasoning, created a different profile for the move than that obtained by Gregory and Casteel.

On the basis of the findings discussed for the conditional move, it is also important to reinforce the context in which the response time and reflection time II behaviors occurred. One could conjecture that even a small incidence of these behaviors may have a positive influence on student growth in conditional reasoning if they occur in a conditional context. The data on the conditional move suggest, however, that the response time and reflection time occurring in the sample classrooms was in reference to factual solicitations rather than to solicitations requiring a reasoned response. By exhibiting a low frequency of the more influential wait-time behaviors and placing them in a non-conditional context, teachers in the study provided a classroom setting in which conditional reasoning growth was unlikely to occur.

Hypothesis 5. No linear relationship exists between the frequency of teacher probing moves and regressed student gain scores in conditional reasoning.

The data reported in Chapter 4 not only support the null hypothesis, but the weakest correlation of the seven moves was found

between the frequency of teacher probing moves and regressed student gain in conditional reasoning ability.

The lack of a significant linear relationship was expected based on the prior research on process-product research involving probing as reported in the literature review on teacher behavior. The inconsistent findings for probing have led to much debate, and even those studies which have shown significant correlates have focused on lower level cognitive processes. To date, no identifiable research has found a significant linear relationship between probing moves and conditional reasoning.

From a logical point of view, several of the specific behaviors, namely puzzlement, explanatory/clarification, relational, and justification, involved in the probing move provide opportunities associated with practice in conditional reasoning. Participating teachers, however, used only one of the techniques--explanatory/clarification--with any degree of frequency as reported below:

Behavior	Frequency	Mean per Lesson
Minimal Reinforcement	28	.72
Minimal Criticism	112	2.87
Puzzlement	70	1.79
Explanatory/Clarification	102	2.62
Reconstruction	1	.03
Relational	1	.03
Justification	31	.79
Redirection	28	.72
Miscellaneous	51	1.31

As can be seen above, the use of puzzlement, explanatory/clarification, and justification constituted less than one-half of the

instances recorded for the probing move and thus the potential effect of these behaviors was not evidenced.

As in the case of the wait-time move, the context in which the probing move was utilized must be reviewed in reference to the findings for the conditional move. Probing moves conducted in relation to student statements based on conditional reasoning would tend to provide students with additional opportunities/stimuli for critical thinking growth. However, if the probing move is used to acquire additional factual data or clarify factual data, then no opportunity for conditional reasoning growth is provided. The discussion and data provided in reference to the conditional move indicate that the geography teachers in this study did not provide conditional contexts for the probing moves nor did they extensively utilize the probing moves most likely to promote conditional reasoning.

A final consideration regarding the results reported is that the use of probing moves by the teachers may not be typical of teachers overall. Although no research has been identified which establishes norms for teacher probing moves, the teachers in this study utilized a mean of only 10.87 probing moves in comparison to 11.8 recorded in Gleason's (1978) study of student teachers. Under the circumstances, it is possible that a potential level of effect was not attained.

Hypothesis 6. No linear relationship exists between the frequency of teacher reacting moves and regressed student gain scores in conditional thinking.

As evidenced by the results reported in Chapter 4, the null hypothesis must be accepted. As indicated in the literature review,

the research on correlates between reacting moves and students' achievement has been inconsistent. Gregory and Casteel's (1975) study of eighth-grade mathematics and social studies classes is the only identified study which has attempted to link reacting moves and logical reasoning. The results of that study indicated a significant positive correlation between the specific behavior of multiple reinforcement and logical reasoning for mathematics classes but no significant correlation was found in the social studies classes.

The geography teachers involved in the current study utilized a mean of only 2.18 reacting moves per lesson, and within that low incidence the specific behavior of multiple reinforcement was utilized on the average of 1.03 times. The low frequency of use combined with the narrow range of use, from zero to seven with only one teacher not utilizing the behavior, may have produced a level of variance too negligible to have a measureable impact on the effect of the composite reacting move actually utilized in the correlational computation.

The results reported by Gregory and Casteel for mathematics classes do not include specific data on the incidence of multiple reinforcement in the social studies classrooms, but Gleason (1978, p. 42) reported that for the student teachers involved in his study, mathematics teachers utilized a mean of 11.6 reacting moves compared to a mean of 7.6 for social studies teachers. Based on an inspection of reacting moves by the geography teachers involved in the current study, one could hypothesize that for social studies teachers the reacting move may be an incidental behavior, while mathematics teachers utilize reacting moves in a more methodical pattern. The

lack of concrete data in the research reported and the general lack of inquiry in this area inhibit verification of this possibility.

The reacting move must also be viewed in the context in which the move was exhibited. In an environment in which students are encouraged to enhibit conditional reasoning, one would expect the teacher reacting move to be heavily utilized in order to provide specific feedback for student growth. If the objective of instruction is limited to factual recall, a lower incidence of teacher reacting may be expected to occur as the teacher merely accepts or rejects the facutal student comments. The design of the TSOS does not recognize the simple acknowledgment or rejection of an answer as a reacting move with educational significance. Although no concrete data are thus supplied by the TSOS profiling the factual-focused vs. the reasoning-focused classroom, two observations are possible. First, the low incidence of reacting in itself suggests the focus of instruction was on the acquisition and recall of factual subject matter. Secondly, this probability is supported by the data on the conditional and wait-time moves which suggest that the teacher was the primary reasoning agent and students had little opportunity to practice or manifest reasoning.

Hypothesis 7. No linear relationship exists between the frequency of teacher obstructive moves and regressed student gain scores in conditional reasoning.

As evidenced by the results reported in Chapter 4, the null hypothesis must be accepted. The literature review regarding the obstructive move might lead the researcher into anticipating a significant negative correlation to conditional reasoning growth, but

it should be noted that most of the products that have been stressed in process-product research have focused on lower level cognitive achievement rather than on thinking skills.

Gregory and Casteel (1975) reported a significant negative correlation between student confusion and logical reasoning growth in mathematics classrooms but did not obtain the same results in social studies classrooms. As discussed by Gregory and Casteel and included in the earlier interpretation of results for Hypothesis 3, the use of conditionals in mathematics classrooms related to a decrease in the frequency of obstructive moves. This phenomenon was not evidenced, however, in social studies classes. Tables A-2 and A-3 in Appendix A report that the geography teachers in the current study had a positive, though low, correlation between conditional moves and obstructive moves.

The pattern of behaviors utilized by the geography teachers within the obstructive move can not be compared to the Gregory and Casteel study because specific behavior data were not reported. Wright and Nuthall (1970), however, reported a mean for postquestion structuring of 9.8 and a mean of 27.2 for multiple solicitation in a study of elementary science classrooms which found a negative correlation between postquestion structuring and student achievement. In this study a mean of 6.10 was found for postquestion structuring and a mean of 11.31 for multiple solicitation. This may indicate that, although the two behaviors were not found to correlate with growth, a greater frequency than that obtained in this study might have been significant.

Hypothesis 8. No linear relationship exists between the frequency of teacher inhibiting moves and regressed student gain scores in conditional reasoning.

As reported in Chapter 4, a significant positive correlation was identified and, therefore, the null hypothesis must be rejected. The correlations, $r = .6093$ for mean frequency and $r = .6951$ for median frequency, were the highest correlations identified. These were the only cases in which both mean and median correlated to conditional reasoning gain and the only positive correlates identified for the seven moves.

The data generated force the researcher to substantiate the illogical premise that a dysfunctional teaching act does, in fact, relate positively to conditional reasoning growth or else identify anomalies in the statistical procedure and research setting which may explain the results. First and foremost, one must remind oneself that the data reflect a correlation rather than a causal relationship, and no inferences should be drawn regarding causation. Consequently, it would be invalid to infer that either the lack of teacher behavior caused the lack of student growth or that the lack of student growth is attributable to the lack of teacher behavior. In any correlational study the researcher needs to be sensitive to extremes in variables with which correlations are drawn. High standard deviations in either variable may have a tendency to produce a correlation coefficient which is not truly indicative of the relationship.

In the current study emphasis has been placed on two factors which affect interpretation of data--the low mean of student regressed gain (1.6902) and the high standard deviation in student regressed

gain (6.0084). These factors, combined with the high standard deviation (6.5262) for teacher utilization of the inhibiting move, suggest caution regarding the validity of the correlation coefficient. The range of frequencies for the 13 teachers in the inhibiting move, as illustrated in Chapter 4, Table 4-4, is 26 with a mean of 4.15. If teacher number 8 is deleted from the sample, the range changes to 6 and the mean to .5. A similar effect occurs with student regressed gain in conditional reasoning. The range of mean regressed gain, as reported in Table 4-1, is 7.2483. If the mean regressed student gain for teacher number 8 is eliminated, the range changes to 6.1071. Reduction of the sample by one, possibly atypical, teacher changes the profile provided by the original statistical treatment.

The research setting or design may be a factor in producing results which are contrary to logic. Two elements are of particular concern:

1. Observations. The fact that teachers had an opportunity to select which lesson to audio-tape may have produced artificial variations in behavior. One teacher may have selected only the "best" lessons for taping while another may have utilized the tape regardless of the "success" of the lesson.

2. Instrumentation. The Technical Skills Observation Schedule is a low inferential observation instrument focusing on teacher verbal behavior. The use of transcribed tapes eliminated possible context cues for the coder such as teacher body language and student reactions.

The 13 teachers involved in the study have been either directly observed by the researcher or their records reviewed since the study

was conducted. In the case of teacher number 8, the transcripts reflect an ineffective classroom setting with a high ratio, 81:106, of dysfunctional moves to functional moves. The profile is contradictory to the record of the teacher who has an excellent reputation with administrators and whose performance has been observed on several random occasions. The teacher enjoys a close relationship with students and is the sponsor of several school activities.

The specific behavior frequencies within the inhibiting move for teacher number 8 and the other 12 teachers are compared below:

Behavior	Mean Frequency		
	Teacher 8	12 Teachers	13 Teachers
Teacher Interruptive	0.00	0.11	0.10
Student Interruptive	0.00	0.00	0.00
Excessive Criticism	0.67	0.19	0.23
Teacher Ridicule	7.33	0.50	1.03
Student Ridicule	0.67	0.03	0.08

As can be seen above, teacher number 8 deviates most significantly in the specific behavior of teacher ridicule. The notation or coding of ridicule in the TSOS may not reflect the actual behavior of the teacher which may be mediated by teacher body language and student generalized perception of the teacher. If the behaviors had been directly observed by the coder and context cues utilized, the coding might have varied significantly.

In comparing the results for the inhibiting move to earlier research referenced in the literature review, emphasis should be placed on the fact that teacher criticism was the most commonly studied phenomenon. Although consistent results--Rosenshine (1971)

and Soar (1966)--have been reported showing a negative correlation between teacher criticism and student achievement, no identifiable studies have examined the effect of teacher ridicule on achievement. The loading of frequencies for the inhibiting move by the inclusion of teacher ridicule as a behavior within the move may have been a factor in producing the results reported in the study.

Thus far the discussion has assumed that teacher inhibition is dysfunctional. However, if the positive correlation is accepted at face value, then one must view teacher inhibiting moves as a functional move related to the development of student conditional reasoning ability. Such a possibility may be consistent with logic if an inverted "U" curve (Soar, 1972) is postulated. In the context of an inverted "U" curve, the inhibiting move may be functional up to a certain frequency and dysfunctional beyond that point. The use of the inhibiting move suggests that the teachers are attentive to student discourse/behavior. The two inhibiting behaviors most commonly used by the geography teachers, ridicule and excessive criticism, demonstrate attention. The low frequency of the inhibiting move demonstrated by the teachers and the statistical treatment applied to the data do not allow verification of the "U" curve possibility. Such a phenomenon should be considered, however, in the interpretation of these results and future related research.

Implications

The data generated in this study raise two issues.

1. Why was minimal growth in conditional reasoning manifested by the students?

2. Why were there no significant positive correlations between regressed student gain in conditional reasoning and teacher moves which are normally valued by educators?

The following suggestions are presented as best guesses based on current literature and observed tendencies in teaching.

1. The 11-week period between pre- and posttesting may not have been adequate to allow variations in teacher behavior to significantly affect student conditional reasoning growth. This was particularly probable in consideration of the fact that conditional reasoning growth was not an objective specified by the teachers in their lessons nor indicated in school district curriculum guides. An 11-week treatment may be adequate for a specially designed intense treatment program but may be inadequate to measure the acquisition of "incidental" learning. The Gregory (1972) and Gregory and Casteel (1975) studies, on which this investigation was based, used treatment periods of 14 and 20 weeks, respectively.

2. The Cornell Conditional Reasoning Test, Form X, used as pre- and posttest instrument in the study, may not be reflective of true growth. The test is composed of 72 items using 6 items to test each of 12 principles of conditional logic. The use of letter symbols and short sentence structures may give students the impression of a mathematics or language test. No items contain content related to geographic subject matter. Without proper introduction and encouragement by teachers, the students may not have exercised appropriate effort, particularly on the posttest which lacked the novelty which may have been present in the pretest.

3. The seventh-grade geography students and teachers involved in the study were in a middle school setting. The literature and philosophy associated with the middle school movement suggest that the emphasis of curriculum and instruction is on personal development. If this emphasis is given a higher priority than academic cognitive skill development in students, then anticipated growth in critical thinking may not be occurring. Two of the teachers submitted taped lessons which focused on current events "reports" almost exclusively, and a third teacher incorporated current events "reports" as a major part of each lesson. These "reports" consisted of students non-critically reading an article from a newspaper or magazine. Many articles selected were on sports and entertainment and bore little apparent relevance to geography instruction or social studies education in general. Such an activity may expand the student's awareness of events and sources of information, but the lack of synthesis, analysis, or critical comment evidenced in the lessons suggest little opportunity for conditional reasoning growth. This is particularly significant if these tapes were examples of what the teachers considered to be their best lessons.

4. The use of mean class growth as a variable in the study resulted in a loss of intra-class variance which was relatively large. The "washing out" of variance resulting from the use of the appropriate statistical procedure makes straightforward interpretations about growth and correlates to growth uncertain.

5. The interactive effect between teacher moves in the TSOS may be a factor in producing the correlations reported. The authors view the moves and incorporated behaviors as a "cluster" of technical

teaching skills. To suggest that a given teacher move, e.g., the conditional, impacts exclusively on the conditional reasoning realm of student growth without mediating influences from other moves and other realms of growth is to suggest a mechanically sterile view of the classroom environment which is indefensible. Gregory's (1972) study with mathematics teachers may have involved an interactive effect. Such an effect would not have been identified because teacher behavior was reviewed only in context of the conditional move. In the Gregory and Casteel (1975) study, more concern was demonstrated for the interactive effect. The relationship between conditional moves and obstructive moves was identified as a factor in explaining divergent results for mathematics and social studies classrooms. Gage and Winne (1975) explained that "any single kind of teacher behavior should not be expected to have a large effect on student achievement. Teacher behaviors, even those which are complex should reasonably be expected to be more influential when considered in combinations" (p. 157). An analysis of data using combinations of moves may have produced quite different correlations and interpretations.

6. The existence of a curvilinear relationship between teacher moves and student growth in conditional reasoning may be a factor in explaining some or all correlates. As discussed in relation to the inhibiting move, the effect may be positively correlated up to a point, after which utilization may have a negative relationship. The low utilization of wait-time (high 19), reacting (high 8), and inhibiting (high 4) moves in particular require cautious interpretations.

7. The arrangement of behaviors within moves of the TSOS may result in a loading effect or profile inconsistent with the concept of the move used by other researchers. Although the TSOS is based on extensive research into teacher behavior, the arrangement of some of the specific behaviors may be arbitrary.

Recommendations for Further Research

Based on this study, the following research agenda would appear to have merit for educational practice.

1. The study should be replicated using a longer treatment period between pre- and posttesting and with other social studies subjects.

2. A test of conditional reasoning needs to be developed and validated using social studies content as a context.

3. Norms of teacher move frequency need to be established for teachers in a variety of subject areas, instructional levels, and experiential levels.

4. The data generated by the study need to be reanalyzed to identify interrelationships between moves.

5. The data generated by the study need to be reanalyzed to identify possible correlates between specific behaviors within moves and regressed student gain in conditional reasoning.

6. The wait-time, reacting, and inhibiting moves need to be studied utilizing a statistical process which will identify curvilinear effects.

Conclusion

This study focused on three questions. Each question is delineated and summarily answered as follows:

1. How much conditional reasoning growth occurs in secondary social studies classes? As measured by the Cornell Conditional Reasoning Test, Form X, over an 11-week period, very little conditional reasoning growth occurs. Seven of the 13 classes studied had negative regressed mean gain scores.

2. What is the frequency of specific teacher verbal presentational behaviors in secondary social studies classes? As coded from three transcribed audio-tapes per teacher using the Technical Skills Observation Schedule, teacher frequencies ranged from a high mean frequency of 47.67 obstructive moves for teacher number 7 to a low mean frequency of 0 on the inhibiting move for teachers 2, 6, and 11. Mean frequencies are reported in Chapter 4, Table 4-2, and specific frequencies for each observation in Table 4-4.

3. What relationship exists between the frequency of specific teacher verbal presentational behaviors and student growth by class in conditional reasoning? As established through the use of a Pearson product moment correlation, and an a priori significance level of $P < .05$, no significant linear relationship exists between student growth by class in conditional reasoning and the frequency of teacher use of the conditional, wait-time, probing, reacting, or obstructive moves. A significant linear relationship does exist between student growth by class in conditional reasoning and (1) the mean frequency of teachers' use of the structuring move (-.5767) and (2) the mean and median frequency of teachers' use of the inhibiting move (.6903

and .6951). With the exception of the inhibiting move, all correlations were negative. This is to be expected when normal move frequencies are correlated with minimal student growth.

Analysis and interpretation of the data suggested that the focus of instruction was on recall of cognitive information. Teachers demonstrated conditional reasoning during classroom discourse but did not provide students with an opportunity to practice conditional reasoning as evidenced by associated conditional solicitations, probing, and reacting moves.

Critical thinking is a valued goal in social studies instruction. It is likely to retain its appeal. Nevertheless, with John Dewey, one must fear that it will be honored in conversation and ignored in practice.

APPENDIX A
DATA TABLES

Table A-1

Student Raw Scores by Teacher

Teacher #1			Teacher #2			Teacher #3		
Student	Pre	Post	Student	Pre	Post	Student	Pre	Post
A	40	33	A	31	36	A	25	34
B	29	40	B	20	20	B	25	26
C	26	35	C	34	29	C	30	25
D	44	38	D	25	31	D	38	40
E	42	46	E	26	31	E	31	41
F	27	34	F	38	34	F	37	38
G	27	38	G	31	36	G	37	40
H	24	28	H	28	31	H	38	43
I	39	43	I	33	41	I	43	44
J	25	23	J	28	26	J	39	43
K	42	45	K	27	22	K	45	44
L	35	41	L	21	26	L	39	30
M	43	47	M	35	33	M	42	43
N	37	41	N	17	34	N	37	39
O	39	45	O	24	29	O	34	39
P	41	44				P	29	28
Q	28	35				Q	41	47
R	33	37				R	22	29
S	37	33						
T	30	44						
U	36	44						
V	33	32						

Table A-1

continued

Teacher #4		
Student	Pre	Post
A	45	46
B	43	43
C	34	42
D	34	44
E	32	44
F	32	42
G	30	36
H	40	43
I	39	44
J	24	34
K	44	44
L	45	45
M	30	27
N	26	38
O	37	44
P	35	30
Q	40	44
R	44	48
S	44	48

Teacher #5		
Student	Pre	Post
A	19	40
B	42	44
C	31	36
D	25	26
E	39	44
F	33	38
G	30	30
H	50	50
I	33	36
J	23	38
K	43	50
L	43	50

Teacher #6		
Student	Pre	Post
A	27	47
B	20	23
C	43	42
D	21	21
E	30	31
F	44	44
G	41	44
H	30	46
I	30	32
J	44	42
K	47	51
L	33	33
M	43	46
N	46	48
O	32	36
P	34	28
Q	38	36
R	42	36
S	40	32
T	42	42
U	43	50
V	46	45
W	40	39
X	39	30

Teacher #7		
Student	Pre	Post
A	27	36
B	41	47
C	31	15
D	44	51
E	28	25
F	38	38
G	42	41
H	31	41
I	35	40
J	32	27
K	31	35
L	44	46
M	18	25
N	20	25
O	28	47
P	34	30
Q	43	45

Teacher #8		
Student	Pre	Post
A	20	35
B	18	28
C	17	45
D	32	35
E	30	32
F	2	33
G	24	35
H	36	40
I	22	27
J	27	43
K	20	35
L	23	43
M	26	40
N	25	38
O	23	30

Teacher #9		
Student	Pre	Post
A	26	42
B	33	47
C	20	26
D	43	41
E	29	34
F	25	35
G	28	24
H	27	37
I	27	41
J	35	44
K	43	45
L	24	45
M	40	42
N	36	34
O	18	39
P	30	41

Table A-1

continued

Teacher #10			Teacher #11			Teacher #12		
Student	Pre	Post	Student	Pre	Post	Student	Pre	Post
A	17	33	A	40	33	A	29	26
B	11	28	B	31	42	B	34	40
C	18	19	C	40	44	C	44	47
D	26	46	D	46	42	D	41	47
E	23	35	E	44	39	E	16	15
F	33	37	F	41	42	F	48	48
G	21	29	G	42	40	G	28	39
H	28	29	H	42	39	H	46	21
I	17	24	I	33	36	I	46	35
J	19	38	J	41	38	J	33	44
K	24	29	K	46	48	K	39	44
L	42	47	L	44	38	L	37	41
M	24	38	M	32	29	M	42	44
N	16	29	N	46	44	N	33	47
O	23	40	O	29	26	O	34	46
P	13	17	P	43	34	P	37	41
Q	17	40	Q	39	43	Q	37	41
R	32	33	R	34	46	R	36	45
S	34	34	S	22	26	S	48	41
T	40	42	T	39	42	T	28	23
U	31	34	U	39	38			
			V	47	45			
			W	46	50			
			X	32	32			

Table A-1

continued

Teacher #10		
Student	Pre	Post
A	44	42
B	42	46
C	40	32
D	30	27
E	40	39
F	40	37
G	33	45
H	34	35
I	36	38
J	33	38
K	38	34
L	39	43
M	35	36
N	42	47
O	41	37
P	41	47
Q	45	44
R	20	34
S	37	34

Table A-2

Coefficient of Correlation between Mean Move Frequencies

	Structuring	Conditional	Wait-Time	Probing	Reacting	Obstructive	Inhibiting
Structuring	1.0000	*.7076	.3545	*.6677	*.8177	.4914	-.2638
Conditional		1.0000	-.0729	.2125	.5645	.1309	*-.9490
Wait-Time			1.0000	*.5939	.2151	*.6682	.0911
Probing				1.0000	*.5942	*.8395	-.0545
Reacting					1.0000	.3740	-.2551
Obstructive						1.0000	.0173
Inhibiting							1.0000

*Significant at $P < .05$

Table A-3

Coefficient of Correlation between Median Move Frequencies

	Structuring	Conditional	Wait-Time	Probing	Reacting	Obstructive	Inhibiting
Structuring	1.0000	*.7160	.4064	*.6672	*.8201	*.5768	-.3377
Conditional		1.0000	-.0110	.2259	*.6783	.2492	-.0417
Wait-Time			1.0000	*.5956	.1865	*.6135	-.0702
Probing				1.0000	*.6175	*.8291	-.1661
Reacting					1.0000	.4560	-.0962
Obstructive						1.0000	-.1440
Inhibiting							1.0000

*Significant at $P < .05$

APPENDIX B
OPERATIONAL DEFINITIONS--THE TECHNICAL SKILL
OBSERVATION SCHEDULE

Structuring Move

If a teacher introduces a lesson; AND
If a teacher establishes the focus of a lesson; AND
If a teacher assigns purpose to a lesson; AND
If a teacher provides an overview of the major components of the lesson that is to be taught:

Then a structuring move, called lesson set, occurs.

If a teacher is teaching a lesson that contains more than one learning activity; AND
If teacher establishes or re-establishes the focus of the lesson; AND
If a teacher assigns purpose to the new learning activity; AND
If a teacher describes or introduces the new activity:

Then a structuring move, called internal set, occurs.

If teacher is teaching a lesson that contains more than one learning activity or component; AND
If a teacher summarizes one learning activity or component; AND
If a teacher identifies what he believes students have learned from the learning activity or component; AND
If a teacher relates what he believes students have learned to the focus of the lesson:

Then a structuring move, called internal closure, occurs.

If a teacher has taught a lesson; AND
If a teacher summarizes the lesson; AND
If a teacher identifies important learnings; AND
If a teacher refers to or reviews the focus of a lesson; AND
If a teacher relates learnings to the focus of the lesson; AND
If a teacher links the completed lesson to the next lesson he plans to teach:

Then a structuring move, called preset closure, occurs.

If a teacher is conducting a class; AND
If the teacher is about to make, is making, or has just made what he believes is a particularly important statement or sequence of statements; AND

If the teacher informs students that it is significant that they remember the statement:

Then a structuring move, called an indicative statement, occurs.

If a teacher is conducting a class; AND
If a teacher is using a resource (e.g., a map or graph) or a learning stimulus (e.g., a math problem); AND
If a teacher uses a statement in order to direct student attention to a particular element of the resource or a particular aspect of the learning stimulus; AND
If the component of the resource or aspect of the learning stimulus so identified provides an intellectual context for student behavior; AND
If a teacher provides a solicitation (i.e., a question or a direction) that students may respond to by referring to the designated element of the resource or the designated aspect of the learning stimulus:

Then a structuring move, called a focal solicitation, occurs.

If a teacher is conducting a lesson; AND

If a teacher uses declarative statements or imperative statements in order to establish an intellectual context; AND
If a teacher ends his statements by providing a solicitation (i.e., a question or direction to which students are expected to respond); AND
If the solicitation, as provided, is to be comprehended and responded to in terms of the context that is given:

Then a structuring move, called a contextual solicitation, occurs.

If teacher is conducting a class; AND
If a teacher uses declarative statements or imperative statements in order to establish an intellectual context; AND
If teacher terminates his statements by deriving a conclusion that is to be comprehended in terms of the given context:

Then a structuring move, called a contextual explanation, occurs.

Conditional Move

If a teacher is conducting a class; AND
If the teacher uses conditional words or phrases (e.g., suppose, let's suppose, say, let's say, assume, let's assume, imagine, let's imagine, pretend, let's pretend); AND
If the teacher uses declarative or imperative statements in order to establish an intellectual context for students; AND
If a conditional word or phrase (or more) are used in order to introduce the intellectual context or in order to present the intellectual context; AND

If a teacher terminates his statements by providing a solicitation to which students are expected to respond; AND
If the solicitation provided is one that is to be comprehended and responded to in terms of the given context:

Then a conditional move, called a cued solicitation, occurs.

If a teacher is conducting a class; AND
If the teacher employs conditional words or phrases (e.g., suppose, let's suppose, say, let's say, assume, let's assume, imagine, let's imagine, pretend, let's pretend); AND
If the teacher uses declarative or imperative statements in order to establish an intellectual context for students; AND
If a conditional word or phrase (or more) are used in order to introduce the intellectual context or in order to present the intellectual context; AND
If the teacher terminates his statements by deriving a conclusion that students are to comprehend in terms of the context given by the teacher:

Then a conditional move, called a cued explanation, occurs.

If a teacher is conducting a class; AND
If the teacher has used declarative or imperative statements in order to provide an intellectual context; AND
If the teacher provides a solicitation to which students are expected to respond; AND
If the solicitation is one that may be responded to in terms of the context provided by the teacher; AND
If, between the time that the context is provided and the solicitation is given to students, the teacher uses clauses that begin with conditional words or phrases (e.g., if, when, since, whenever, given, in order to, according to, supposing, saying, imagining, pretending, assuming); AND
If the clause introduced by a conditional word or phrase reminds students that as they frame a response to the solicitation they are to remember and consider the given context:

Then a conditional move, called a linked solicitation, occurs.

If a teacher is conducting a class; AND
If a teacher uses a clause involving the use of conditional words or phrases; AND
If the use of the conditional word or phrase is neither cueing nor linking, as defined above:

Then a conditional move, called a conditional statement, occurs.

If a teacher is conducting a class; AND
If the teacher uses conditional words or phrases in order to cue students that an intellectual context is being provided; AND
If the teacher uses a conditional word or phrase to link a solicitation to the cued context:

Then a hypothetico-deductive solicitation occurs.

If a teacher is conducting a class; AND
If the teacher uses a conditional word or phrase to cue students that an intellectual context is being established; AND
If the teacher uses a conditional word or phrase to link a conclusion that he derives from this context:

Then a hypothetico-deductive explanation occurs.

Wait-Time Move

If a teacher is conducting a class; AND
If the teacher has expressed a complete thought (e.g., conveying information, stating a definition, articulating and interpretation, providing a procedure, or establishing a context); AND
If there is at least a three-second interval of silence in which the teacher simply waits (i.e., he does not write on or erase the board, open a window, go to the desk for a book, etc.); AND
If, following the interval of silence, the teacher is the one who continues to talk:

Then a wait-time move, called pausing, occurs.

If a teacher is conducting a class; AND
If a teacher employs a solicitation; AND
If there is an interval of at least three seconds of silence between the time that a teacher delivers the solicitation and the time at which the student begins to respond:

Then a wait-time move, called response time, occurs.

If a teacher is conducting a class; AND
If one or more students have talked in response to a solicitation, in reaction to another student, or voluntarily; AND
If, following an interval of at least three seconds, one or more students continue to talk:

Then a wait-time move, called reflection time I, occurs.

If a teacher is conducting a class; AND
If a student or students have talked in reaction to a solicitation, in reaction to another student, or voluntarily; AND
If, following the last student who talks, there is a three-second interval of silence before the teacher begins to talk:

Then a wait-time move, called reflection time II, occurs.

If a teacher is conducting a class; AND
If students are assigned to a task that requires their attention as individuals or as members of study groups; AND
If the teacher remains silent in order that students may work as assigned; AND

If, following the time that students are assigned to the learning task, no student asks that the teacher's directions be repeated or clarified:

Then a wait-time move, called study time, occurs.

Probing Move

If a teacher is conducting a class; AND
If a student has talked in response to a solicitation, in reaction to the statements of another student, or voluntarily; AND
If the student's talk is followed by at least a one-second interval of silence; AND
If the teacher encourages the student to continue his statement or add to it; AND
If the teacher provides the encouragement and then stops talking in order that the student may continue; AND
If the student does continue:

Then a probing move, called minimal reinforcement, occurs.

If a teacher is conducting a class; AND
If a student has talked in response to a solicitation, in reaction to the statement or another student, or voluntarily; AND
If the student's talk is followed by at least a one-second interval of silence; AND
If the teacher stops talking once he has made the criticism, in order that the student may react or correct the error; AND
If the student does continue:

Then a probing move, called minimal criticism, occurs.

If a teacher is conducting a class; AND
If a student has talked in response to a solicitation, in reaction to another student, or voluntarily; AND
If the student's talk is followed by at least a one-second interval of silence; AND
If the teacher indicates that the student's talk has left him, as teacher, or the class confused; AND
If having indicated that he is confused, the teacher stops talking in order that the student may continue to talk; AND
If the student does continue:

Then a probing move, called puzzlement, occurs.

If a teacher is conducting a class; AND
If a student has talked in response to a solicitation, in reaction to another student, or voluntarily; AND
If the student's talk is followed by at least a one-second interval of silence; AND

If the teacher asks the student to explain or clarify his statement; AND
If the teacher, having requested an explanation or a clarification, stops talking in order that the student may explain or clarify; AND
If the student does continue:

Then a probing move, called explanatory/clarification, occurs.

If a teacher is conducting a class; AND
If a student has talked in response to a solicitation, in reaction to another student, or voluntarily; AND
If, following the one-second interval of silence, the teacher states in his own words what he believes the student has said or attempted to say; AND
If, having restated what he believes the student said, the teacher stops talking in order that the student may continue; AND
If the student does continue:

Then a probing move, called reconstruction, occurs.

If a teacher is conducting a class; AND
If a student has talked in response to a solicitation, in reaction to another student, or voluntarily; AND
If the student's talk is followed by at least a one-second interval of silence; AND
If, following the one-second interval of silence, the teacher asks the student to defend or to indicate how he might defend his response; AND
If, having asked the student to respond, the teacher stops talking in order that the student may continue; AND
If the student continues:

Then a probing move, called justification, occurs.

If a teacher is conducting a class; AND
If at least one student has talked in response to a solicitation, in reaction to another student, or voluntarily; AND
If the student's talk is followed by at least a one-second interval of silence; AND
If, following the interval of silence, the teacher asks another student to extend, comment on, or evaluate the statement; AND
If, having asked another student to react, the teacher stops talking in order that the student may so behave; AND
If at least one student continues:

Then a probing move, called redirection, occurs.

If a teacher is conducting a class; AND
If at least one student has talked; AND
If the student's talk is followed by at least a one-second interval of silence; AND
If, following the interval of silence, the teacher asks for an extension or analysis of previous student talk; AND

If the means for asking students to extend or analyze previous statements is not an example of minimal reinforcement, minimal criticism, puzzlement, explanation/clarification, reconstruction, relational, justification, or redirection probues; AND
If at least one student continues:

Then a probing move, called miscellaneous, occurs.

Reacting

If a teacher is conducting a class; AND
If one or more students have talked; AND
If, between the time that one or more students have talked and the time that the teacher begins to talk, there is at least a one-second interval of silence; AND
If the teacher utters two positive verbal comments about the behavior in close proximity to one another:

Then a reacting move, called multiple reinforcement, occurs.

If a teacher is conducting a class; AND
If one or more students have talked; AND
If, between the time that one or more students have talked and the time that the teacher talks, there is at least a one-second interval of silence; AND
If the teacher points out good, desirable, or valuable qualities about the statement or statements of a student; AND
If the teacher points out poor, erroneous, or illogical flaws in the statement or statements of a student:

Then a reacting move, called reinforcement plus criticism, occurs.

If a teacher is conducting a class; AND
If one or more students have talked; AND
If, between the time that one or more students stop talking and the time that the teacher talks, there is at least a one-second interval of silence; AND
If the teacher praises or judges the statement of one or more students as good, valuable, useful, etc.; AND
If the teacher explains why the praise or judgment of utility is made:

Then a reacting move, called reinforcement plus grounds, occurs.

If a teacher is conducting a class; AND
If one or more students have talked; AND
If, between the time that one or more students stop talking and the time that the teacher talks, there is at least a one-second interval of silence; AND

If the teacher judges student statements as being erroneous or lacking utility; AND
If the teacher explains why the judgment is made:

Then a reacting move, called criticism plus grounds, occurs.

If a teacher is conducting a class; AND
If the teacher identified or has clearly identified the focus of study; AND
If one or more students have talked; AND
If, between the time that one or more students stop talking and the time that the teacher talks, there is at least a one-second interval of silence; AND
If the teacher labels one or more student statements or portions of such statements as possessing good or useful qualities; AND
If the teacher indicates how the statements or portions thereof are related to the focus of study:

Then a reacting move, called reinforcement plus integration, occurs.

If a teacher is conducting a class; AND
If a student has made a statement; AND
If, between the time that one or more students stop talking and the time that the teacher talks, there is at least a one-second interval of silence; AND
If the teacher restates what the student has said; AND
If the teacher credits the student for being the source of the statement; AND
If the teacher judges the student's statement to be useful or praises it:

Then a reacting move, called citation plus reinforcement, occurs.

If a teacher is conducting a class; AND
If a student has made a statement; AND
If, between the time that one or more students stop talking and the time that the teacher talks, there is at least a one-second interval of silence; AND
If the teacher calls attention to the student's statement; AND
If the teacher indicates that the statement is an important one that is to be remembered:

Then a reacting move, called a verbal marker, occurs.

If a teacher is conducting a class; AND
If at least two students have talked (e.g., making interpretations, suggesting procedures, etc.); AND
If what students have said is or appears to be in conflict, i.e., there are at least two viewpoints; AND
If, between the time that students stop talking and the time that the teacher talks, there is at least a one-second interval of silence; AND

If the teacher points out reasons as to why both positions are reasonable, suggests how the two positions are different or similar, or indicates how the differences might be resolved:

Then a reacting move, called citation plus accommodation, occurs.

If a teacher is conducting a class; AND
If several students have made statements (at least three); AND
If, between the time that the last student stops talking and the time at which the teacher begins to talk, there is at least a one-second interval of silence; AND
If the teacher restates the statements of at least three students; AND
If the teacher credits each student whose statement is restated:

Then a reacting move, called multiple citation, occurs.

Obstructive Move

If a teacher is conducting a class; AND
If the teacher, first, uses a solicitation in the guide of either a question or direction; AND
If the teacher, after delivering the solicitation, provides a context within which the question or direction is to be understood:

Then an obstructive move, called postquestion structuring, occurs.

If a teacher is conducting a class; AND
If the teacher asks students to respond to more than one solicitation at the same time:

Then an obstructive move, called multiple solicitations, occurs.

If a teacher is conducting a class; AND
If the teacher employs a solicitation or provides directions for an individual or group task; AND
If one or more students responds to the teacher's solicitation or directions; AND
If the response is to the effect that the student or students do not understand the solicitation or the directions:

Then an obstructive move, called student-expressed confusion, occurs.

If a teacher is conducting a class; AND
If one or more students engage in behaviors that prevent other students from attending to learning task (e.g., loud talking, sharpening a pencil during discussion, falling over backwards in a chair, etc.):

Then an obstructive move, called internal disruptive, occurs.

If a teacher is conducting a class; AND
If behaviors occur that prevent members of the class from attending to the learning task; AND
If these behaviors are not attributable to either the teacher or members of the class (e.g., a teacher comes to the door and borrows a book from the teacher who is teaching the class; the school director's secretary comes to make an important announcement; the students of another teacher talk loudly in the hallway, etc.):

Then an obstructive move, called external disruptive, occurs.

Inhibiting Move

If a teacher is conducting a class; AND
If at least one student is talking in response to a solicitation, in reaction to another student, or voluntarily; AND
If the teacher attempts to talk while the student is still in the process of speaking:

Then an inhibitive move, called teacher interruptive, occurs.

If a teacher is conducting a class; AND
If at least one student is talking in response to a solicitation, in reaction to another student, or voluntarily; AND
If the teacher attempts to talk while the student is still in the process of speaking:

Then an inhibitive move, called teacher interruptive, occurs.

If a teacher is conducting a class; AND
If a student is talking in response to a solicitation, in reaction to another student, or voluntarily; AND
If a second student or other students attempt to begin talking before the first student has finished:

Then an inhibitive move, called student interruptive, occurs.

If a teacher is conducting a class; AND
If one or more students have talked in response to a solicitation, in reaction to another student, or voluntarily; AND
If the teacher points our errors in the student's work or fallacies in the student's reasoning; AND
If the teacher provides more feedback than is necessary in order for the student to comprehend wherein the teacher believes an error exists:

Then an inhibitive move, called excessive criticism, occurs.

If a teacher is conducting a class; AND
If a student has talked or engaged in some other behavior; AND

If the teacher, in order to criticize the student's talk, work, or behavior, challenges the student's sense that he is a worthy class member:

Then an inhibitive move, called teacher ridicule, occurs.

If a teacher is conducting a class; AND
If a student has talked or engaged in other overt behavior; AND
If other students, in order to criticize the student's talk or behavior, challenge the student's right to believe that he is a respected member of the class:

Then an inhibitive move, called student ridicule, occurs.

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APPENDIX C
SAMPLE TRANSCRIPT

Teacher 2--Tape 1

T*--We are going to cover the vocabulary terms you had due for today. There are 35 of them. When I call your name, make sure you give me the definition, and give me complete definitions. First word is Fall-Line. Tom Hazel.

SR**

T--Anybody have anything different for the Fall-Line? Vickie.

SR

T--Very good. That's exactly the definition I'm looking for. It's the boundary between the Piedmont and Coastal Plains. It's called the Fall-Line, and it's the point where the rivers drop sharply, as Vickie said, from the land. OK, Word #2, Father of Waters, Nat.

SR

T--OK, but more specifically, what river are they speaking of?

SR

T--Christie.

SR

T--Mississippi River, mainly because the Mississippi River is one of the largest in the world, and it . . .*** ever since our history began, people went up and down the Mississippi as their main transportation route. Any time people were shipping goods, they had to ship by water at that time, and the Mississippi was one of the main water routes of the United States in that period. Cereal Bowl, word #3, Nat.

---

*Teacher's comments.

**Student's response.

***Inaudible.

SR [Student defined Corn Belt, not Cereal Bowl].

T--OK. Again, we are studying the Northeastern part of the United States. The Corn Belt is a region in the Northeastern part of the United States where most of our corn is grown. That's why they give the name Corn Belt. If you lived in certain places in Ohio, around Akron, Ohio, they would be called the Snow Belt, so obviously that region is going to have more snow than any place else so they attached the word Belt to cover a wide region. OK, Cereal Bowl, Sandra.

SR

T--OK, Cereal Bowl, again, is just like the Corn Belt, except in the Cereal Bowl most of the grain is grown, and that's where they call it the Cereal Belt, Cereal Bowl, because you have oats and wheat, even though that part of the country does not produce as much wheat as another part, it still produces enough grains to be called the Cereal Bowl. OK, Word #5, Hybrid Corn, Lisa.

SR

T--OK. That's where you take, you take two types of corn, say you what you have one type of corn that's more tolerant of water, not needing much water to grow, and another type that might be just a little sweeter than another corn. You can pollinate and fertilize by joining those two corns, and you can produce a third corn, one that might be more tolerant of water and still taste just as sweet. Spring Wheat, #6, Christie.

SR

T--OK. The reason, like she said, it's the kind of wheat that is grown mainly in the spring, the reason being, can anyone tell me why they call it spring wheat?

SR

T--Very good. Winters are long and cold, so obviously your growing season is going to be affected, and the majority of your wheat is going to come up in springtime, but you will have, it's not like down here where we can keep growing crops the year around just about because there's not a dramatic change in the weather. Uh, their winters are long and cold, and they have a certain amount of time when they can grow a certain product. OK, Fallowing, Nat.

SR

T--OK, as Nat said, when you fallow, this type of farming, all the crops and vegetation that were on the land are taken off. Can anybody tell me why they would want to take all that off the land before they start using it? Nat.

SR

T--OK. Rainfall's very important for anyone who is growing crops, and if you have this land that you are going to use and you have a lot of vegetation on it, say trees, shrubs, uh, any other type of crop, when the water, when the rain falls, what is going to happen to the rain if there's a lot of other plants there?

SR

T--OK. This way the plants will take up that rainfall or moisture and dry the soil out. This way by fallowing the soil's kept, I mean the moisture is kept within the soil. Uh, #8, Bank. Christie.

SR

T--OK. Did you ever hear of bank, not referring to the monetary banks that we have here? It's a place in the ocean where the water is not too deep, not very deep at all. OK, Plankton. Margo.

SR

T--OK, plankton, small animals and plants. Algae, Greg.

SR

T--OK, algae is just simply seaweed. Now people who theorize that over the next couple hundred of years or so, we are going to be so overpopulated that we're not going to have enough food to grow for our world. So what do you think one of the main sources of food is going to be? Plankton and seaweed, and seaweed, what you can do, you can just get seaweed from the beach here, you boil it in salt water, and after you boil it out there, you boil it again in fresh water, and you cook it, and it has the taste of had some before and it tastes sort of worse than spinach, but like anything else you can always put more outside ingredients into it to make it taste better. Like say for instance, you put butter on it, or cheese, like you have cheese and broccoli. It's not going to taste as good, but it's, you know, it's why they call the ocean a garden because eventually we are going to run out, we fear we are going to have to get water from the ocean's water. OK, Seine, S E I N E. Lisa.

SR

T--OK, seine is a type of net that's used to catching fish. Uh, Otter Trawl, Vickie.

SR

T--OK, an otter trawl is a type of net that is shaped like a cone, and when you drop it in a certain area, the water is sort of like sucks up the life that's there, fish in other words, so it's brought up out of the water. It's another method used in fishing that's slowly replacing the long line method which is #13. Long line method is having maybe a couple of miles of net just strung out and individual

nets strung off the boats. This becomes rather expensive and turned out to be harder work than it would be for the otter trawls. So the otter trawls is going to replace the way people have been fishing before, which is the long line method. Uh, Black Diamonds, Christie.

SR

T--OK, it's another name for coal. In other words, we're saying coal is black obviously, but it has enough value, enough wealth for us to use for fuels, and so on, that we almost consider it like a diamond or gold. In Texas the oil there is called what?

SR

T--OK, black gold. The word Texas feels means the oil is just as valuable to them as it is to gold because it brings in money and it helps our nation to survive with what energy sources we have. Uh, Bituminous, Nat.

SR

T--OK, bituminous is soft coal. Anthracite, Sandra.

SR

T--Hard coal. And then there's a third type called lignite, and what's the definition of lignite?

SR

T--OK, it's the softest coal. In other words, we are giving you hard coal, soft coal, and then to break it down say the softest coal. Who would know what we would use lignite for? Obviously, we are not going to use it to heat homes, whatever, Vickie?

SR

T--OK, just leave the machine, the tape projector alone until we are finished. OK, what would we use the lignite for? Anybody ever see carbon paper? OK, for instance, right here, is a form of carbon paper. It's made from soft coal. Right here. Obviously you can see you use it to duplicate things. If I wrote on this, it would write, transfer to another sheet of paper. Real soft coal which was lignite, could have been made to make this carbon paper. OK, strip mining, word #18, Tom.

SR

T--OK, it's the least costly method of what?

SR

T--Mining a certain product, what would be the product which we are referring to now?

SR

T--Which we just discussed.

SR

T--Coal. Strip mining, uh, a lot of states have passed laws outlawing it. What they do is they bring in a big bulldozer and a couple of heavy equipment machines and they just strip the top of the land and strip the minerals out of the land. If you go through states like Ohio and Pennsylvania, and they have a lot of strip mining, you might see this huge hill of forest, and they strip mine it, it is totally leveled. I mean there's still a hill there, but the trees are gone, what rocks and vegetation and else was there is gone, and some states require that once you do that if they give you the permission to strip mine, you have to put the land back in the shape it was when you started. So most of the time when they do strip mine up north they replace it with the pine trees because pine trees are hardy, and they easily adapt to almost any type of climate and weather. So they, they just strip the whole countryside, get the minerals they want out, and they plant everything back, trying to get it the way it was before they started. OK, drift mine, Nat.

SR

T--OK, someone using the drift mine method, it means that they found a supply of resources, say coal, on a hillside. Obviously on a hillside, you're not going to dig straight down from the top of the mountain because it's going to be costly, and you might not even be anywhere near where the supply is, so you go into the mountain. You don't have to use tunnels, you don't have to use shafts, or anything. Just dig right into the side of the mountain and extract the coal from there. Shaft mine, Nat.

SR

T--OK, strip mining's the least costly and is done just on the surface. What would strip, uh, shaft mining mean? Vickie.

SR

T--OK. So anytime you use the shaft mining means that the supply of coal or resource that you are looking for is deep down in the earth's surface, and you can't tunnel in from the hillside, you can't extract it from on top, you've got to dig straight down, which means you have to build mine shafts and go down, go down, and go down, as far as you have to go to that point. Anybody tell me what disease a lot of times miners contract from being in coal mines? Does anyone know? Vickie.

SR

T--OK. They get, because they're underneath the earth's surface and there's not much of a source of oxygen except for what they can channel in themselves, these particles, which they're working down

there for eight, ten, twelve hours a day, end up being taken in by the breathing system and ends up in their lungs, and it starts to decay their lungs. That's why a lot of miners, it seems like, that they've been smoking carton after carton of cigarettes per day when actually they might not smoke, but being down in the mine for that long a time that many days and if consecutively, it deposits in their lungs, and it destroys their lungs, and eventually they do die, but it's called black lung disease, and every miner that supposedly has been mining coal that becomes affected with it. It generally first interrupts your breathing, you start coughing so long that you find it harder and harder to breathe, and eventually you do die from it. But that's another cost because why would people still do that knowing that they were going to die if they went down and worked in the mine? Tom?

SR

T--OK, they want the coal. What else do they want besides the coal? Vickie.

SR

T--They want the money. In these regions where coal is mined, you're not going to find any factories and because, mainly because of the countryside, it's rocky, the soil's rocky, not very good farmland. Factories won't build there because it's rough in the mountains and not near a river, which is the main reason for people building factories because the water power to generator. They, that's the only source of life they have. Other than that they go out and trap their own food, and so on because they can't afford to drive from the mountain down to the base of the mountain to another town to work everyday. There's a job there and it's pretty decent paying job, but it's one of the stakes you have to make is decide whether or not to feed your family or take good care of yourself. Obviously, if you don't take good care of yourself, you're not going to be there to support them anyway. But it is the main source of income for that area. Brine, Nat.

SR

T--OK, brine is just dissolved salt and water. Manufacturing Belt, Vickie.

SR

T--It's a region where . . .

SR

T--What would they do in a manufacturing belt? Christie.

SR

T--OK. If you live in a manufacturing belt, it's a region of large cities, and they are going to have numerous and large factories. So

obviously if you look at a map of the United States, which area is the most heavily populated, and would be considered a manufacturing belt? It would be the southeast or the northwest or northeast, midwest? Anyone. Where the Manufacturing Belt is. What chapter are you studying? What is the title of Chapter 6?

SR

T--Northeastern United States would be the Manufacturing Belt along with the Corn Belt and the Cereal Bowl are all found in Northeastern United States. Now if you just hear the word Northeastern United States, which states do you commonly think of?

SR

T--Which states are in the Northeast? But look at the map in the book on page 76. Northeastern United States, where, name some states that are in the Northeastern part of the United States, Nat.

SR

T--No, you are talking the Southeast. Debbie.

SR

T--Uh, . . . ? We'll get back to that in a minute and why it's right and why it isn't. Nat.

SR

T--You look in the Northeast. Look over in the Northwest, California's a Northwestern state, Washington's a Northwestern state.

SR

T--Directly the opposite would be the Northeastern states.

SR

T--Maine, very good. What else?

SR

T--New York, what's another one?

SR

T--New Hampshire.

SR

T--Rhode Island, Massachusetts, Vermont. But the Northeastern region of the United States, a lot of people when they first think of it or hear of it, they think it's just these states on the Atlantic Ocean

that border on the Atlantic Ocean and the east coast. The Northeast region that we're talking about stretches from the state of Maine, which you can look, is clear up in the right-hand corner of your map, and extends clear beyond the Great Lakes, which would be like Lake Superior. So you came down from Lake Superior you would take in part of the state of Minnesota, Iowa, and Illinois. That whole region is known as the Northeast, so when she said Minnesota or Wisconsin, actually it is Northeast because the Northeastern region stretches to west of the Great Lakes. OK, what occurs in the manufacturing belt? Manufacturing Belt is the region in the Northeastern United States where most of the factories are, most of the products in the United States are manufactured or processed in the Northeastern part. So if there's a manufacturing belt, why would they call it that? You call it that because that's where the manufacturing takes place. It's just like when I was giving you an example of, uh, snow belt, most of the snow gets in a certain area, it's called a Snow Belt. A Manufacturing Belt is more of the manufacturing is done in this part of the Northeastern United States. Assembly Line. Sandra.

SR

T--OK, she gave you an example, like an automotive kind???, but what is actually the process?

SR

T--OK, anytime you have an assembly line production, the reason why do they have it, instead of, say we are all working in an automotive plant in Detroit. Instead of myself constructing the chassis, putting on the body, putting on the windshield wipers, putting on the windshield, and putting on all the tires, we call it, what we have we call specialization, which means we all are going to be up, lined up alongside this belt, and as the product is being come down, in this case which is an automobile, I, my job might be just to put the hubcaps on the driver's side of the car. And every car that comes by, I would do that. I wouldn't have to fool around with windshield wipers or windshields, or mirrors, or upholstery, or anything. I have a special job. Instead of me doing the whole job of constructing the car, I help do one certain thing. In that way, you can become more efficient because it's going to cut down in time and cost by just having people do their one special task. In other words, they are trained for one special thing, and once they are trained, it's easy to manufacture something like that. OK, the next word--automoation, Christie.

SR

T--The automation is using machinery to produce. In our early history, most of our labor was human labor, and we didn't have what you call automation, until the Industrial Revolution. Now that we do have automation we are able to mix it in with human labor, and find an efficient way of manufacturing. The machines and humans can work together. Metropolitan, Nat.

SR

T--OK. It's an area, metropolitan is an area that includes many towns, many other cities that are bordered by or on the boundary of a larger city. Sometimes these, uh, metropolis, could be miles and miles and miles and miles, but it's anything, any town or city that's located within that boundary, in that area. New York City would be a good example. Now, uh, megalopolis, Christie.

SR

T--OK, it's a stretched out city that could be streteched out into other states. What is the largest megalopolis in the United States? Nat.

SR

T--OK, that's a megalopolis. Stretching from Washington, D.C., to the hub of our govern, nation's capital, it stretches all the way up the eastern coast, taking in other states along with it all the way to Boston, Massachusetts. OK, city that is known as the hub of America. Greg.

SR

T--OK, Chicago. Can anyone tell me why it is called the hub of America? Nat.

SR

T--As the crossroads of the country.

SR

T--So, if you look back on earliest history, Chicago is one of the main centers of economic activity. They joined the east and the west just like we know Ohio does. Its name is connecting city, it connects the east and the west. All the trade that used to go from east to west or west to east would always stop by in Chicago first to be shipped out of Chicago, transported out of Chicago. City of Brotherly Love, Nat.

SR

T--OK, why was it called the City of Brotherly Love?

SR

T--Very good. The city of Philadelphia was set out to be the City of Brotherly Love by its founder, the colony was founded, Pennsylvania colony was founded by William Penn. William Penn had hoped that the city of Philadelphia would be a haven or home for people of good will. OK, Auto City, it should be fairly obvious. Vickie.

SR

T--Detroit. And why is it called the Auto City? Obviously, automobiles are made there, but what percentage? Nat.

SR

T--Very good. More than half of the cars produced in the world have been produced in Detroit. OK, Connecting City. Lisa.

SR

T--OK, Cleveland is Connecting City. Why is it called the Connecting City?

SR

T--It's located on Lake Erie. You can look on page 76 on the map of the United States, and if you look up, you will see the Great Lakes. You can see Lake Erie. Now Cleveland is at the bottom of Lake Erie, what would make them the connecting part? What value is Cleveland to this part of the country, Nat?

SR

T--OK, the main reason why Cleveland is called the Connecting City, it connects east and west, it borders on Lake Erie, which is a land, a water route which you can use, and there's a lot of manufacturing there because they place factories where there's going to be a large source of water. Cleveland connects the east and west, so it's a very valuable port of the. . . ? Uh, Mississippi Metropolis. Margo.

SR

T--OK, St. Louis is known as the Mississippi Metropolis, mainly because the importance of the Mississippi River. You uh, it's one of the largest in the world, and St. Louis is right on the Mississippi River, so that became an important port to ship goods, so you could ship them north and south on the Mississippi River, so it's one of the bigger cities on the Mississippi River, Cities of importance. Uh, Cradle of Liberty, Thelma.

SR

T--OK, Boston is the Cradle of Liberty. Why do they call it the Cradle of Liberty? Nat.

SR

T--OK. When we start, started getting disenchanged with England when they were ruling us. In the beginning they gave the colonies loose control, which meant you could run your colony the way you wanted to. After the French and Indian War, England lost a lot of money, and a

way to get this money back was to tax the colonies. So they held a tighter grip on us. So what happened in Boston? The first thing was major propaganda of the American Revolution was the Boston Massacre. It was the first confrontation between the British and the colonists, and it started over something as simple as the children throwing snowballs. Someone heard the order to fire, they released fire and killed four or five people and they used it as a slogan to build up support for final revolutionary war. Nat said the Boston Tea Party. So we were protesting the tax on tea, so we dressed up like the Indians, the colonists dressed up like Indians so they wouldn't be suspected of it, dumped the tea overboard. A lot of the things that were responsible for us gaining our independence happened in that area. That's why it's called the Cradle of Liberty. Uh, Iron Steel City. Jesse.

SR

T--Pittsburgh. Pittsburgh is one of the major suppliers of iron and steel products. If you had to Pittsburgh 20 or 25 years ago, you would probably say what a dreary, dismal, unhealthy area because the pollution, factories, and the steel mills, and steel plants, there wasn't any regulation on. They were mainly out to produce and make money, so a lot of the wastes were poured into the atmosphere and into the air. Pittsburgh was a very dirty, dismal place to live in. The State of Pennsylvania said, "Mind, if you want to have the factories, you want to produce, you have got to get certain regulations, which mean you had to have certain pollutions in your factories so you are not letting out all this pollution." I was from the area, and then I was back there last summer, and they had really cleaned up the city of Pittsburgh. The air is still bad, but the city itself has taken a new, clean look. They've knocked down a lot of the old slum areas, and built them back up. It's becoming a better city to live in. Christie.

SR

T--OK, the nation's capital.

SR

T--Washington, D.C. That's where our government is housed. Another interesting thing about that, since our government's house there, what do you think would happen if there was a nuclear attack? What would be one of the first places someone would bomb?

SR

T--Washington, D.C. But, Washington, D.C., people obviously knew that could happen, so they built underground offices. If that attack does occur, they can run the country's overnment from underground. So all along Washington, D.C., and around Virginia, there are government offices underground that, in case of nuclear war, we can move government from there. Washington, D.C., is one of the most polluted

cities, and Washington, D.C., does not have any factories. Where would most of the pollution come from in Washington, D.C.? If you don't have any factories, what's other sources of their pollution? What do you ride in to come to school everyday?

SR

T--A car or bus, or so on. Washington, D.C., the main source of economic activity is people working for the government. There aren't any factories to speak of, but there are enough people driving cars going to and from work, more buses taking people to and from work, that builds up the high amount of air pollution. And if you ever go to Washington, D.C., especially in August, August is one of the hottest months. What happens is you have this still air because of the climate surrounding it, it kind of forms a pocket, and you can look out from the state of Maryland, which it's just 12 miles outside of Washington, D.C., you could look out over the city of Washington, D.C., and see nothing but a huge mass of what looked like black air. What happens is the weather, the climate that you are having is this high humidity and so on, is trapping that air, and it stays there for a couple of days. It's just like walking out into the back of a bus, and its exhaust is coming out is exactly what you feel like. And there are certain times where a week or even more, people with respiratory problems, which means lung problems, breathing problems, are supposed to stay inside because it could be harmful to their health. OK, Home of the National Anthem. Margo.

SR

T--Baltimore, Maryland. How did that, how did Baltimore get that name?

SR

T--It, some place is the home of something, what does it mean?

SR

T--OK, if Naples was the home of the man--, was known as the home of the manatee, why would it be given that name?

SR

T--OK, that's where it's discovered, that's where the source of it. So any place that has the source of a certain thing could be called the home of something. So Baltimore, Maryland, is where our, home of our national anthem was composed, so they call Baltimore the home of

SR

T--Our national anthem. OK, we've got one part of the filmstrip that's talking about the Northeast. This film defines exactly what's exactly the Northeast, and what do we mean by define? This film says

it's going to define Northeast, Northeastern United States, what's it going to do?

SR

T--It's going to tell you about it, it's going to show you the states that do make it up, and what region of the country they are talking about. OK, now. OK, start the, uh, recorder.

[Filmstrip is shown to the class.]

T--What did this filmstrip tell you about the Northeast? You take, let's say, as an extreme northeast such as Maine, you ask yourself, what's the type of life style they have? Fast-paced or easy going. Can anyone tell me? Are they fast-paced or easy-going society of people?

SR

T--They're easy going. They're laid back, they're more conservative. They like the way their life has been, they want to keep the nice countryside, they don't want to bring in the trappers and so on. Can anyone tell me, just raise your hand, that's one state in the northeast. As you know, the filmstrip said there were how many states making up the northeast? Lisa. On that. . . ? How many?

SR

T--Very good. Nine. Can anyone name one of those states? Tom.

SR

T--Maine. Can anyone tell me the capital of Maine? Lisa.

SR

T--Augustus. What's another state that's considered northeastern. Nat.

SR

T--Pennsylvania. What's the capital of Pennsylvania?

SR

T--No, it's not Morrisville. It's a city near Morrisville. Harrisburg is the capital of Pennsylvania. OK, is there a lot of farming in Pennsylvania or lot of factories in Pennsylvania or a mixture of both?

SR

T--Both. Mainly because you have the major steel centers, coal centers, and there is good farming. Why isn't there good farming in the Northeast, in the upper extremes of the Northeast, let's say Maine, Massachusetts, and so on?

SR

T--OK, some states, that they did say 25% of the people in the United States live on 4% of the land, another reason why some of the regions, upper northeast, is because of the soil. The soil is rocky, the ground is rough, and a lot of other things, and that's why Boston is the major seaport of the land, because they had to find another way of life because they couldn't be farmers because of the soil. What about another state of the northeast, one of our largest states in population?

SR

T--Rhode Island is our smallest. What is our largest of those states mentioned?

SR

T--Maine is one of the larger in areas but the one with the most people in it?

SR

T--New York. And what did life look like according to the filmstrip in New York? OK, it's fast-paced, . . . a lot of people going to work, coming from work, cars lined up, and so on. But what did they say about upper New York? What activities go on in upper New York? It's great for apples are grown there. OK, upper New York, you know you have the city life in New York City, upper New York is one of the better farmland regions of our country. OK, what body of water does Northeastern United States lie upon?

SR

T--OK, Lake Erie is one small body of water where they, what's the ocean, Nat?

SR

T--The ocean, Atlantic or Pacific?

SR

T--OK, Atlantic. What country borders on Northeastern United States that's north of it? What country lies directly north of the United States?

SR

T--Ohio's a state. What country? Jesse.

SR

T--Canada. OK, Canada's a country that borders on the northern part. OK, for tomorrow since we're out of time, the bell's going to ring, we're going to have a test over the first 15 vocabulary words, not all 35 of them. We're going to break it up into two or three individual tests, and you're to read pages 110, 115, and do question box 21 on page 111.

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BIOGRAPHICAL SKETCH

Theron Lavern Trimble, Jr., was born January 18, 1943, in Long Beach, California. He attended schools in Guam, Cuba, Massachusetts, Virginia, and Jacksonville, Florida, before graduating in 1962 from Escambia High School in Pensacola, Florida. He received an Associate of Arts degree from Pensacola Junior College in 1964 and a B.S. in social studies education from Florida State University in 1965. After teaching social studies and mathematics at the junior high school level in Pensacola for one-and-a-half years, he returned to Florida State University and completed an M.S. degree in 1968 with concentration in social studies education and Asian history.

During the 14 years from 1968 to 1982 Theron taught social studies in Jacksonville, Florida, served as a curriculum specialist for projects in Jacksonville and Sarasota, and was an adjunct instructor teaching social science and education courses for Jacksonville University, Nova University, Jones College, and Florida Junior College. He is a past President and Director Emeritus of the Florida Council for the Social Studies. Since 1982, Theron has been Coordinator of Social Studies and Fine Arts for the Collier County, Florida, School District where he is responsible for curriculum development and instructional supervision in social studies, art, and music. He is married to the former Laurine Lockhart and has two children, Troy Wayne and Terry Lyle Trimble.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.

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